UNINTERRUPTIBLE POWER SUPPLY

UPS SLC TWIN PRO series

4 to 20 kVA

USER'S MANUAL

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1. Introduction.

1.1. Acknowledgement letter.

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully before starting up the equipment and keep it for any possible future consult that can arise.

We remain at you entire disposal for any further information or any query you should wish to make.

Yours sincerely.

SALICRU

- ❒ The equipment here described **can cause important physical damages due to wrong handling**. This is why, the installation, maintenance and/or fixing of the here described equipment must be done by our staff or **specifically authorised**.
- ❒ According to our policy of constant evolution, **we reserve the right to modify the specifications in part or in whole without forewarning**.
- ❒ All **reproduction or third party concession of this manual is prohibited** without **the previous written authorization** of our firm.

1.2. Using this manual.

The target of this manual or publication is to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. This manual and rest of support documentation has to be read carefully before installing, location change, setting or any handling of any kind, including the start up and shutdown operation.

Keep this document for future consults.

In the next pages, the "**equipment**" and "**S.T.S.**" terms, are referred to the Uninterruptible Power Supply or UPS and Service and Technical Support respectively.

1.2.1. Conventions and used symbols.

Some or all the symbols of this section can be used and shown in the equipment and/or in the description of this document. It is advisable to be familiar with them and understand their meaning.

«**Danger of electrical discharge**» symbol. Pay special attention to it, both in the indication on the equipment and in the paragraph referred to this user's manual, because it contents features and basic informations for person safety. To not respect these indications can result in serious incidents or even the death due to electrical discharges

«**Warning**» symbol. Carefully read the indicated paragraph and take the stated prevention measures, so it contents basic safety instructions for persons. To not respect such instructions can cause serious incidents. Those indications with "CAUTION " symbol content features and basic instructions for safety of the things. To not respect such instructions can damage the goods.

«**Precaution**» symbol. Read the paragraph text and take the stated preventive mediums, it contents the basic instructions and features for the equipment safety. To not respect these indications can create material damages on the own equipment, installation or loads.

«**Notes of information**» symbol. Additional topics that complement the basic procedures. These instructions are important for the equipment use and its optimum efficiency.

«**Main protective earthing terminal**» symbol. Connect the earth cable coming from the installation to this terminal.

«**Earth bonding terminal**». Connect the earth cable coming from the load and the external battery cabinet to this terminal.

Preservation of the environment: The presence of this symbol in the product or in their associated documentation states that, when its useful life is expired, it will not be disposed together with the domestic residuals. In order to avoid possible damages to the environment, separate this product from other residuals and recycle it suitably. The users can contact with their provider or with the pertinent local authorities to be informed on how and where they can take the product to be recycled and/or disposed correctly.

Alternating Current A.C..

Direct Current D.C..

Recycle.

1.2.2. For more information and/or help.

For more information and/or help of your specific unit, contact with our Service and Technical Support (**S.T.S.**).

1.2.3. Safety instructions.

- Check the data of the nameplate are the required by the installation.
- Never forget that the **UPS is a generator of electrical energy**, therefore the **user has to take precautions about against direct and indirect contacts**.

  Its energy source, a part from the AC mains, lies on the batteries, usually included in the same case or cabinet that the equipment electronics. However, some models and/or extended back up times, batteries can be supplied in a separate case or cabinet.

  If the batteries are connected to the equipment and their protections are switched "On", whenever they are, it is irrelevant if the UPS is or not connected to mains, as well as the status of the mains protection. The outlets or output power blocks will supply voltage meanwhile the battery set has energy.
- **Compliance as regards to "Safety instructions" is mandatory, being the user the legal responsible regarding** to its observance and application. Read them carefully and follow the stated steps in the established order, keep them for future consults that may arise.

- If **the instructions are not in total or partial and in special referred to the safety, do not carry on with the installation or commissioning tasks**, because there could be a **risk on your safety or on the other/s persons,** being able to make **serious injuries even the death**, also it can **cause damages to the equipment and/or to the loads and installation**.
- The local electrical regulations and the different restrictions of the client's site, they can invalidate some recommendations included in the manuals. When discrepancies exist, the user has to comply the local regulations.
- The equipments provided with power cord with plug and outlets, can be connected and used by personnel without any kind of experience.

  The equipments with power blocks have **to be installed by qualified personnel** and it can be used by personnel with not specific training, just with only help of this manual.

  A person is defined as **qualified**, if it has experience of assembling, commissioning and perfect control operating of the equipment, if he has the requirements to do the job and if has read and understand all the things described in this manual, in particular the safety indications. Such preparation is considered only valid if it is certified by our **S.T.S.**.
- Place the equipment the closest to the power supply and loads to be supplied, leaving an easy access if it were needed an urgent disconnection.

  In the hardwired equipments and due to the impossibility of fast disconnection, a diconnection device (switch) with easy access and close to the equipment will be installed.
- Warning labels should be placed on all primary power switches installed in places away from the equipment to alert the electrical maintenance personnel of the presence of a UPS in the circuit

  The label will bear the following text or an equivalent one:

  Before working in this circuit.

  - Isolate the Uninterruptible Power System (UPS).
  - Check the voltage between all terminals including the protective earth.

  Risk of voltage feedback from UPS.

1.2.3.1. General safety warnings.

- All connections and disconnections of the cables from the equipment, including the control ones, will be done with no power supply and the switches on rest, position «O» or «Off».
- Shutdown the equipment completely by switching «Off» the button of the control panel first. Next disconnect the cable from the wall outlet for equipments up to 3 kVA or by switching «Off» the input circuit breaker and disconnect the power supply cables in models with higher power rate.

  The indiscriminate manoeuvring of the switches may involve production losses and/or equipment damages. Consult the documentation before doing any action
- Pay special attention to the labelling of the equipment that warns about the «Electrical shock hazard». Inside the equipment there are dangerous voltages, never open the enclosure, the access has to be done by qualified staff. In case of maintenance or fault, consult to the closest (**S.T.S.**).
- Cross cable sections used to supply the equipment and loads, will be according to the nominal current stated in the nameplate label of the equipment, and respecting the Low Voltage Electrotechnical Regulations or standards of the country.

  Use approved cables only
- Protection Earth cable of the UPS drives the leakage current of the load devices. An isolated earth cable has to be installed as part of the circuit that supplies the equipment. Cross cable section and its features will be same as the power supply cables, but with green colour with or without the yellow strip.

  All outlets of the UPS has an earth bonding, duly connected and those equipments with power blocks there is an exclusive terminal for the load earth connection. When an outgoing distribution is done, i.e power strips, it is essential that they have an earth terminal connected to each one of them.

  It is essential that the cables that supplies the loads have the earth connection cable.

  The protection earth must be connected to the frame or metallic chassis of any electrical equipment (in our case to the UPS, battery cabinet or case and loads), assuring that it is done before connecting the input voltage.

  Check the quality and availability of the earth, it has to be between the defined parameters by the local or national regulations.
- For the smallest devices (the ones connected with the foreseen power cord with plug), the user has to check the wall outlet corresponds with the type of supplied plug, with earth duly installed and connected to the local protection earth.
- During the normal UPS operation, in equipments up to 3kVA the power cord cable can't be disconnected from wall outlet, because the protection earth of the own UPS would be disconnected and also the earth from the loads connected to the output.

  For this reason, the general protection earth cable of the building or switchgear panel that supplies the UPS will not be disconnected.
- In small equipments check that the sum of the leakage currents of the UPS and connected load/s do not exceed over 3,5mA.
- The installation will have input protections sized to the currents of the equipment and stated in the nameplate label (RCD devices type B and circuit breakers with C characteristic or any other equivalent one).

  For equipments with three phase input, and connected to an IT distribution system, the protection will be four poles in order to break the three phases and neutral in the same manoeuvring.

  Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.
- Do not overload the UPS by connecting loads with inrush consumptions at its output, like laser printers.
- For those installations with redundant equipments or separate Bypass line, there will only be a common RCD of 300 to 500 mA at the head of the installation for both lines.
- Output protection will be done with a circuit breaker of C characteristic or an equivalent one.

  It is recommended to distribute the output power, into four lines as minimum. Each one of them will have a protection circuit breaker sized to the quarter of the nominal power. This kind of outgoing distributions will allow that any fault in any device connected to the equipment, that makes a short-circuit, will affect to the line with the faulty device only. An uninterruptible power supply will be guaranteed to the rest of connected loads, due to the protection tripping of the affected line by the short-circuit only.

- When replacing a fuse, do it for another of the same type, characteristics format and size.
- Under any concept the input power cord will be connected to the output of the equipment, either directly or through other ways.
- Models with separate bypass line, a galvanic isolation transformer has to be installed in any of the two lines that supply the UPS (rectifier input or static bypass), to avoid the direct union of the neutral of both lines through the internal wiring of the equipment.

  This is applicable when the two lines are supplied from different mains, i.e.:

  - ❒ Two different electrical companies.
  - ❒ An electrical company and genset, ...
- All the equipments have an auxiliary terminal strip to install an external emergency power off button (EPO), and it will belong to the user property.

  Type of circuit is selectable through the LCD panel of the equipment. The contact is preset from factory as normally open, so the button must be switched to close the circuit and the voltage to the loads is broken. To establish the power supply to the loads again, the EPO button must be deactivated.

  EPO doesn't affect to the power supply of the equipment, it only breaks the power supply to the loads as a safety measure.
- When supplying input voltage to a UPS with fitted in or separate static bypass, although the inverter is still turned «Off» (deactivated) it doesn't mean that at the output there will not be voltage.

  So, to do it, the input and static bypass switches will have to be turned «Off».

  Put warnings of danger and/or emergency switches if the safety Standards require it in your particular installation.
- It is possible that the UPS supplies output voltage through the manual bypass to those equipments that incorporate it either standard or optional, so it will have to be considered as regards to safety. If it were necessary to break the output supply of the equipment in this situation, deactivate the outgoing distribution protection or in case of lack of it the general protection of the distribution panel that feeds the UPS.
- All power supply electrical cables have to be fixed to the equipments and loads, interfaces, etc..., to unmovable parts and in the way to avoid treads, trips on them or fortuitous pulls.
- It is essential the Neutral connection to the input in three phase equipments in the foreseen terminal for that purpose.
- CHASSIS or RACK mounted equipments are destined to be installed in a predetermined set to be done by professionals.
  - ❒ The installation has to be designed and executed by qualified personnel, who will be the responsible to apply the safety and EMC regulations and standards that controls the particular installations where the product is destined.
  - ❒ The equipments assembled in CHASSIS do not have enclosure protection, even the power blocks are unprotected.
  - ❒ Some RACK mounted equipments do not have the power blocks protected.
- Never manipulate the equipment with wet hands.

1.2.3.2. To keep in mind.

- Do not try to dismantle or change any part of the equipment, if this action is not contemplated in this document. Manipulation inside the UPS due to any modification, reparation or any other cause, can make an electrical discharge of high voltage and it is restricted to **qualified** staff only. Do not open the equipment.

  A part from the implicit stated risks, any action that make the modification, internal or external of the equipment or just only the simple intervention inside of itself, which is not stated in this document, **it can expire the warranty**.
- If it is observed that the UPS exhausts smoke or toxic gas, shutdown it immediately and disconnect it from the power supply. This kind of fault can cause fire or electrical discharge. Contact with our **(S.T.S.)**.
- In case of an accidental equipment dropping or if the enclosure is damaged, do not start it up under any concept. This kind of fault can cause fire or electrical discharge. Contact with our **(S.T.S.)**.
- Do not cut, manipulate the electrical cables, do not put heavy objects over them too. Any of these actions could cause a short-circuit and make a fire or electrical discharge.

  Check that the electrical cables of connection, plugs and outlets are in good conditions.
- When moving an equipment from a cold place to a warm environment and vice versa, it can cause condensation (small water drops) in the external and internal surfaces. Before installing a moved equipment from another place or even packaged, the equipment will be left for a minimum time of two hours in the new location before making any action, with the purpose of adapting it to the new environmental conditions and avoid the possible condensations.

  The UPS has to be completely dry before starting any installation task.
- Do not store, install or expose the equipment in corrosive, wets, dusty inflammable or explosive environments and never outdoors.
- Avoid to locate, install or store the equipment in a place with direct sunlight or high temperatures. Batteries could be damaged.

  In the exceptional case and long exposition to intense heat, batteries can cause filtrations, overheating or explosions, which can cause fires, burn or other injuries. High temperatures can also make deformation in the plastic enclosure.
- The location will be spacious, airy, away from heat sources and easy access.
- Do not obstruct the cooling grids by entering objects through themselves or other orifices.
- In equipments of low power rate (up to 3kVA), leave as minimum space of 25 cm in the equipment peripheral and 50 cm for higher power rates equipments.
- Also in the UPS with power blocks, it is recommended to leave another additional 50 cm for an eventual intervention of the (**S.T.S.**), considering that if it means to move the UPS, the connected cables will have the needed clearance.
- Do not put materials over the equipment or parts that obstruct the correct visualization of the synoptic.
- Some equipments can have lifting lugs and together with the documentation, a screws are supplied to replace them once the UPS is located, in order to correct the look of the product.
- Be careful to not wet it, because it is not waterproof. Do not allow entering any kind of liquids in. If accidentally the outside of the machine comes into contact with liquids or salt air, dry it with a soft and absorbent cloth.
- To clean the equipment, wipe over a damp cloth and then dry it. Avoid sprinkling or spillage that could enter through the slots or cooling grids, which may cause fire or electric shock.

Do not clean the equipments with products that could have alcohol, benzene, solvent or other inflammable substances, or they are abrasive, corrosive, liquids or detergent.

- When it is needed to remove the protection cover to access to the terminals, they will have to be put back before starting up the equipment. Otherwise you may incur personal injury or equipment damage.
- Be careful to not lift heavy loads without help, according to the following recommendations:
  - ❒ , < 18 kg.
  - ❒ , 18 - 32 kg.
  - ❒ , 32 - 55 kg.
  - ❒ , > 55 kg.
- UPSs are electronic equipments, so they will be treated as they are:
  - ❒ Avoid shocks.
  - ❒ Avoid jolting or bouncing of the UPS, like those produced by moving the equipment on a hand truck and move on an uneven or wavy surface.
- UPS transport will be done packaged inside its original packaging in order to prevent it from shock and impact and by means of the suitable type of packaging (carton box, pallet packaging, ...) and appropriate to its weight.
- Although the physical location of the elements can difer from the illustrations in this manual in some cases, the correct labelling correct the possible doubts and makes easy its comprenhension.

1.2.3.3. Safety warning regarding batteries.

- The manipulation and connection of the batteries shall be done and supervised by **personnel with battery knowledge only**.

  Before doing any action, disconnect the batteries. Check that no current is present and there is not dangerous voltage in the DC BUS (capacitors) or in the endpoint of the battery set terminals.

  Battery circuit is not isolated from input voltage. Dangerous voltages can be found between the terminals of the battery set and the earth. Check that there is not any voltage at the input before take any action over them.
- When faulty batteries are replaced, the complete battery set has to be replaced, less exceptional cases in new equipments, were due to manufacturing faults it will only be replaced the defective ones.

  The replacement will be done by another one of the same type, voltage, capacity, quantity and brand. All of them has to be of the same brand.
- Generally, the used batteries are sealed lead acid of 12V and maintenance free (VRLA).
- Do not reuse the faulty batteries. There could be an explosion or burst any battery with the involved problems and issues that could happen.
- Generally supplied batteries are installed in the same cabinet, case or rack of the equipment. Depending on the power, autonomy or both, they can be supplied separately from the equipment in another cabinet, case or rack, with the interlink cables among them. Do not modify its length.
- In those equipments requested without batteries, their acquisition, installation and connection of themselves will be done by the end-user and **under his responsibility**. Data concerning the batteries as regards to quantity, capacity and voltage, are stated in this battery label sticked beside the nameplate of the equipment. **Respect these data**, battery connection polarity and the supplied circuit diagram **strictly**.

  For an optimum and efficient operating, the battery set has to be located as close as possible to the equipment.
- The battery voltage can involve the risk of electric shock and can produce high short circuit currents. Observe the following preventive measures before manipulating any terminal block identified in the labelling as «Batteries»:
  - ❒ Disconnect the corresponding protection elements.
  - ❒ When connecting a battery cabinet to the equipment, respect the cable's polarity and colour (red-positive; black-negative) indicated in the manual and in the corresponding labelling.
  - ❒ Wear rubber gloves and shoes.
  - ❒ Use tools with insulated handles.
  - ❒ Take off watches, rings or other metal objects.
  - ❒ Do not place metal tools or objects over the batteries.
  - ❒ Never manipulate with your hands or through conducting objects, do not short either the battery terminal block of the equipment or the own from the batteries.
- In order to avoid a complete discharge of the batteries and as a safety measure after a long blackout of the commercial mains and when ending the working day, proceed to the load shutdown and then to the equipment too, by following the operating described in this «User's manual».
- When the equipment and/or battery module has a protection through a fuse and it were needed to be replaced, it will always be done by another one with the same dimension, type and size.
- For long periods of disconnection, consider that the equipment has to be connected once a month for 10 hours as minimum, in order to charge the batteries, so the irreversible degradation of itself is avoided. On the other hand, in case of storing an equipment, it will be done in a fresh and dry place, **never outdoors**.
- Never short the battery terminals as it involves a high risk. It involves the detriment of the equipment and batteries.
- Avoid mechanical efforts and impacts.
- Do not open or mutilate the battery. Spilled electrolyte is harmful and toxic to the skin and eyes.
- Do not dispose the batteries in a fire and high temperatures. The batteries may explode.
- In case of contact of the acid with parts of the body, wash immediately with plenty water and call urgently the nearest medical service.
- Batteries involve a serious risk for the health and for the environment. Their disposal should be done according to the existing laws.

2. Quality and standard guarantee.

2.1. Declaration of the management.

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001** and **ISO 14001** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, through:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

2.2. Standard.

The **SLC TWIN PRO** product is designed, manufactured and commercialized in accordance with the standard **EN ISO 9001** of Quality Management Systems. The CE marking shows the conformity to the EEC Directive by means of the application of the following standards:

- **2006/95/EC** Low voltage directive.
- **2004/108/EC** Electromagnetic Compatibility directive (EMC).

In accordance with the specifications of the harmonized standards. Standards as reference:

- **EN-IEC 62040-1**. Uninterruptible power supply (UPS). Part 1-1: General and safety requirements for UPS's used in accessible areas by end users..
- **EN-IEC 60950-1**. IT equipments. Safety. Part 1: General requirements.
- **EN-IEC 62040-2**. Uninterruptible power supply (UPS). Part 2: EMC requirements.

The manufacturers responsibility is excluded in the event of any modification or intervention in the product by the customer's side.

This is a product for its use in commercial and industrial applications, so restrictions and additional measures can be needed in the installation to prevent perturbations.

Declaration of conformity CE of the product is at the client disposal under previous request to our headquarters offices.

2.3. Environment.

This product has been designed to respect the environment and has been manufactured in accordance with the standard **ISO 14001**.

Equipment recycling at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the recovered product at the end of its useful life (contact your distributor).

Packaging:

To recycle the packing, follow the legal regulations in force.

Batteries:

The batteries mean a serious danger for health and environment. The disposal of them must be done in accordance with the standards in force.

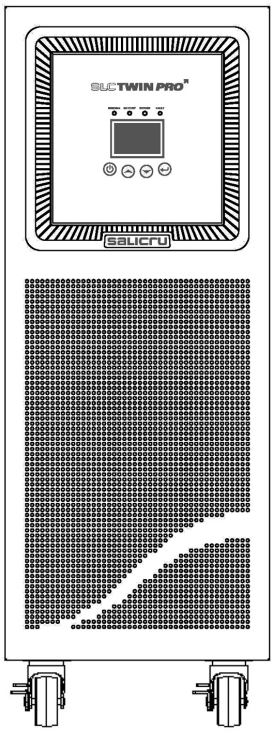
3. Presentation.

3.1. Views.

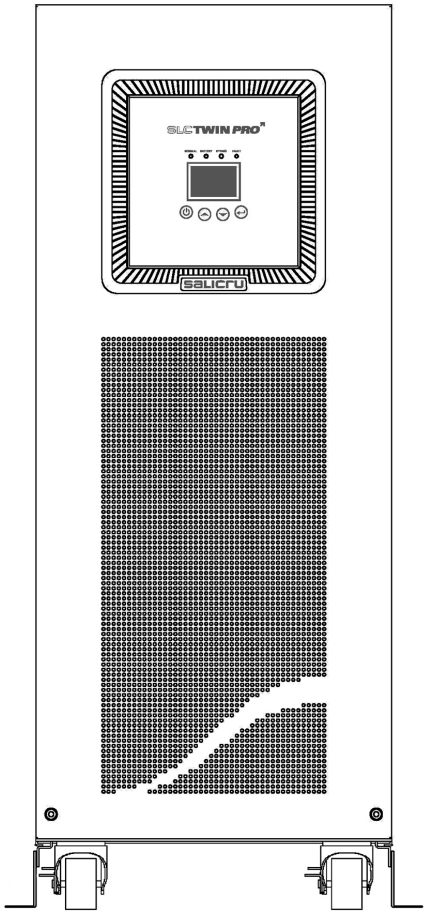
3.1.1. Views of the equipment.

Figures 1 to 3 show the illustrations of the equipment according to the case format and depending on the power of the model. Nevertheless and due to the constant evolution of the product, some discrepancies or small contradictions can arise. In front of any doubt, the labelling of the equipment will always prevail.

Figures regarding its main features or specifications can be checked in the nameplate of the equipment. Keep them in mind for its installation.

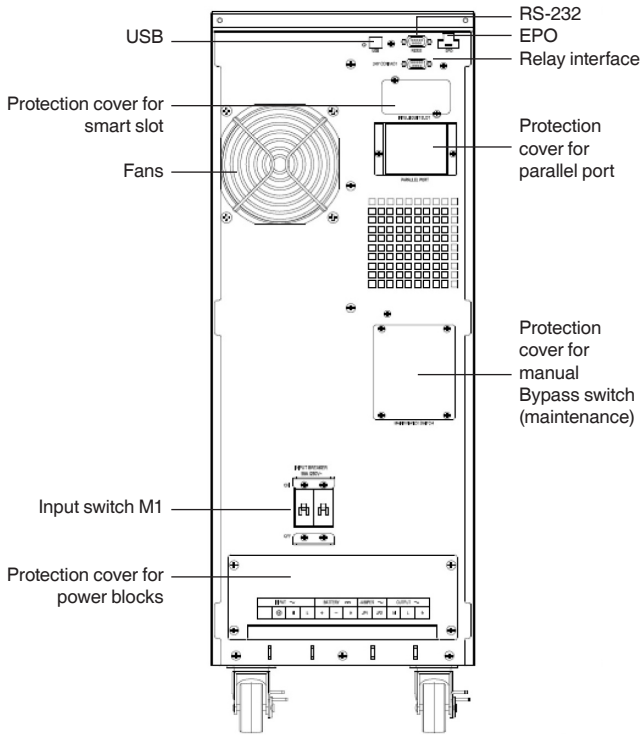


Models from 4 to 10 kVA

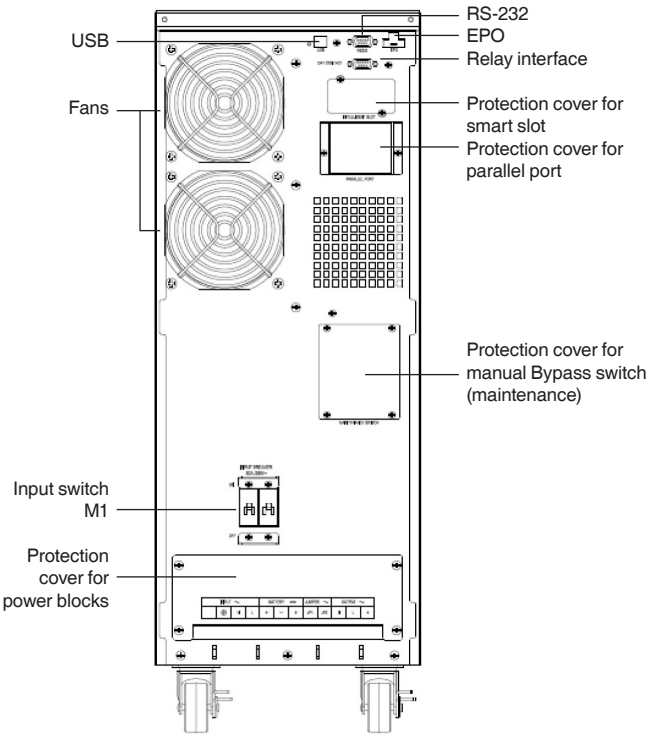


Models from 12 to 20 kVA

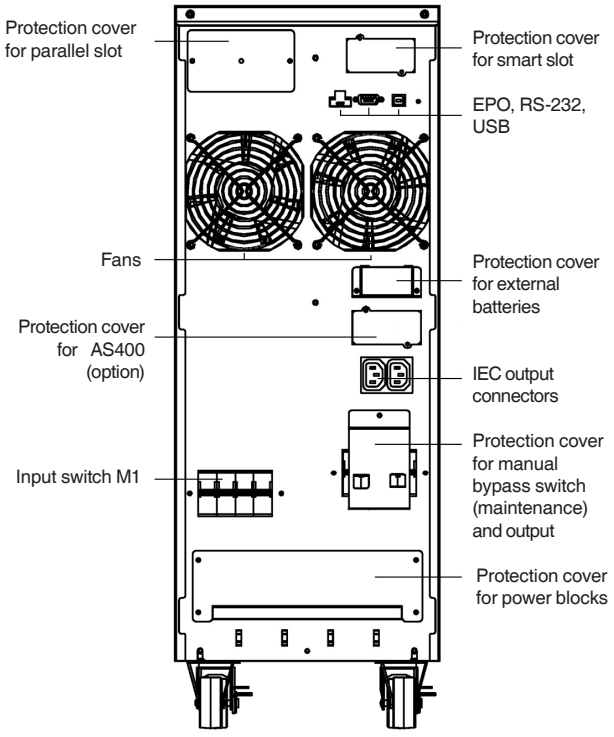
Fig. 1. Front view from 4 to 20 kVA models.



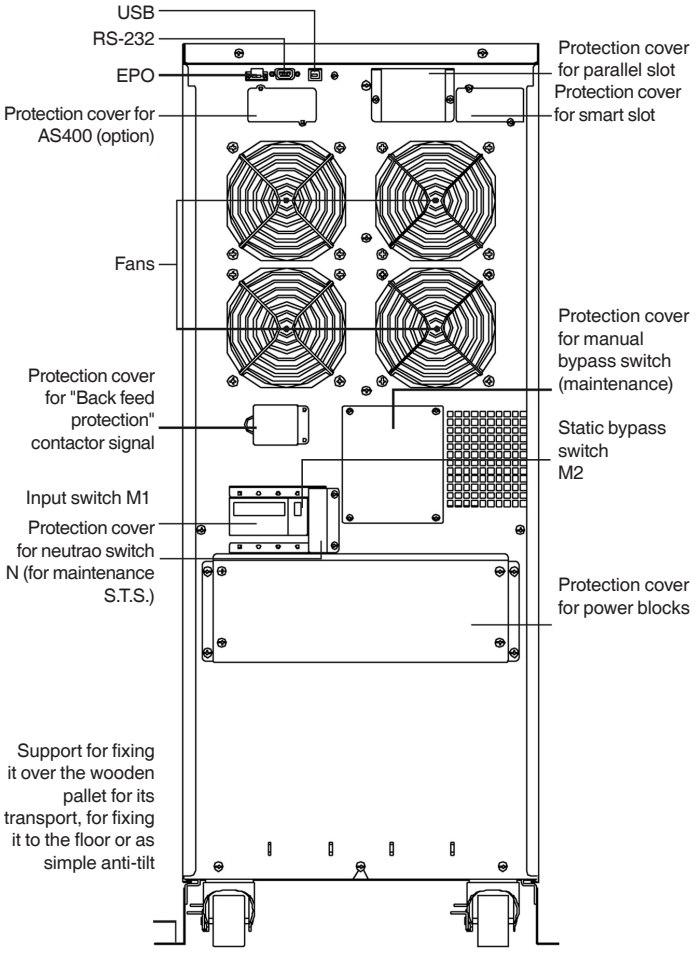
Models from 4 to 6 kVA, sigle phase input and output



Models from 8 to 10 kVA, sigle phase input and output

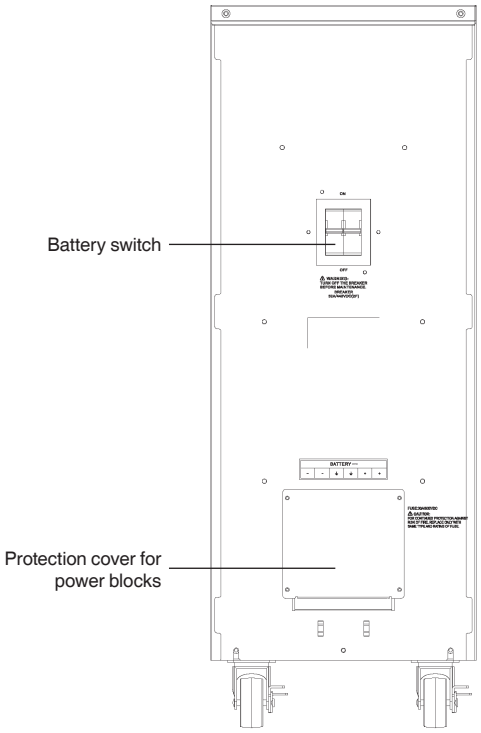

Protection cover for parallel slot
Protection cover for smart slot
EPO, RS-232, USB
Fans
Protection cover for external batteries
Protection cover for AS400 (option)
IEC output connectors
Input switch M1
Protection cover for manual bypass switch (maintenance) and output
Protection cover for power blocks

Models from 8 to 10 kVA, three phase input / single phase output

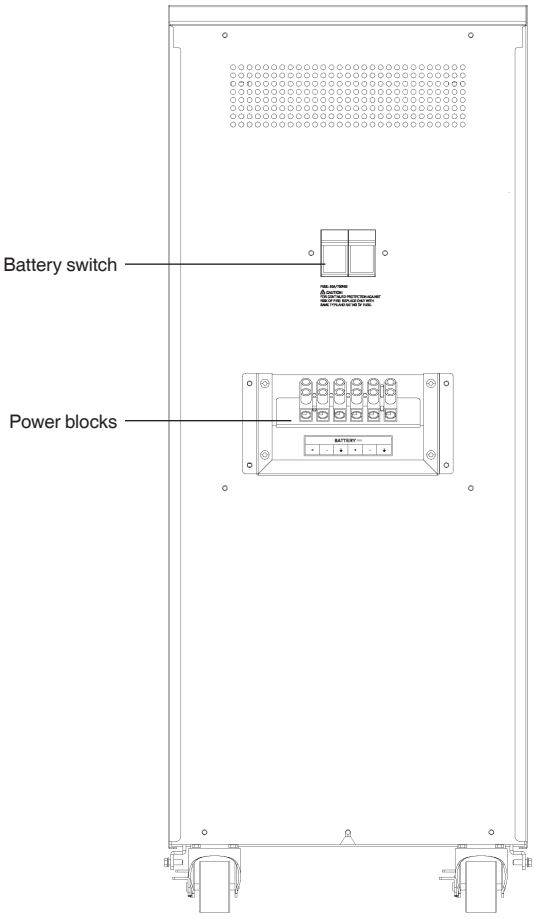

USB
RS-232
EPO
Protection cover for AS400 (option)
Protection cover for parallel slot
Protection cover for smart slot
Fans
Protection cover for manual bypass switch (maintenance)
Protection cover for "Back feed protection" contactor signal
Static bypass switch M2
Input switch M1
Protection cover for neutrao switch N (for maintenance S.T.S.)
Protection cover for power blocks
Support for fixing it over the wooden pallet for its transport, for fixing it to the floor or as simple anti-tilt

Models from 12 to 20 kVA, three phase input / single phase output

Fig. 2. Rear view from 4 to 20 kVA models.



Batteries module for models up to 10 kVA.



Batteries module for models > 10 kVA.

Fig. 3. Rear view batteries module.

3.2. Definition of the product.

3.2.1. Nomenclature.

SLC-8000-TWIN/3 PRO (B1) WCO “EE29503”

EE*	Special specifications of the client.
CO	“Made in Spain” marking in the UPS and its packaging (custom issue).
W	Neutral brand equipment.
B0	No batteries and no space for installing them.
B1	Equipment with extra charger and external batteries to the UPS.
TWIN PRO	Single phase input / output configuration.
TWIN/3 PRO	Three phase input / single phase output configuration.
8000	Power in VA.
SLC	Acronym of the brand.

MOD BAT TWIN PRO 2x6AB003 40A WCO “EE29503”

EE*	Special specifications of the client.
CO	“Made in Spain” marking in the UPS and packaging (custom issue).
W	Neutral brans of the equipment.
40A	Size of the protection.
003	Last three characters of the battery code.
AB	Initials of the battery family.
6	Quantity of batteries in one string.
2x	Quantity of strings in parallel. Omit for only one.
0/	Battery module without them, but with the accessories to install them.
TWIN PRO	Series of the battery module.
MOD BAT	Battery module.

Note as regards to the batteries:

Acronyms B0 and B1 stated in the nomenclature is related to the batteries:

(B0) The equipment is supplied without the batteries and with no accessories (screws and electrical cables).

Batteries owned by the client will be installed out from the case or cabinet of the UPS.

Under request, it is possible to supply the accessories (screws and electrical cables), needed to install and connect the external batteries.

(B1) Equipment with extra battery charger. The equipment is supplied without batteries and no accessories (screws and electrical cables), corresponding to the specific batteries in the model.

Under request is possible to supply the accessories (screws and electrical cables), needed to install and connect the batteries.

For equipments requested with no batteries, the acquisition and connection of them will always be done by the customer and **under his responsibility**.

Data related to batteries about quantity, capacity and voltage are stated in the battery label sticked beside the nameplate of the equipment, **respect strictly** these data and connection polarity of the batteries.

Those equipments with separate bypass line, a galvanic isolation transformer has to be installed in any of both lines that supply the UPS (rectifier input or static bypass), to avoid the direct union of the neutral of both lines through the internal wiring of the equipment.

This is only applicable, when both power supply lines come from two different lines, for example:

- Two different electrical companies.
- An electrical company and a generator set, ...

3.3. Operating principle.

This manual describes the installation and operating of the Uninterruptible Power Supply (UPS) from **SLC TWIN PRO** series as equipments that can operate separately or connected in parallel, without needing a centralised bypass. UPSs from **SLC TWIN PRO** series assure an optimal protection of any critical load, keeping the power supply voltage to the loads between the stated parameters, with no break, during a blackout, deterioration or perturbations of electrical commercial mains and with a wide range of available models (from 4 to 20kVA), it allows adapting the model to the end-user needs.

Thanks to the used technology, PWM (pulse width modulation) and double conversion, UPS from **SLC TWIN PRO** series are compact, cold, silent and high efficiency.

The double conversion principle cancels any perturbations from mains energy. A rectifier converts the AC alternating current from input mains into DC direct current, keeping an optimal battery charging level and supplying the inverter, and at the same time creates an AC sinewave voltage ready to feed the loads permanently. In case of UPS input mains fault, the batteries supplies clean energy to the inverter.

The UPS design and construction from **SLC TWIN PRO** series has been done in accordance with the international regulations.

These equipments allow the upgrading by means of the connection of additional modules of the same power rate, to get redundancy (i.e.: N+1) or to increase the capacity of the system.

So, this series has been designed to maximize the availability of the critical loads and to assure that your business is protected against perturbations of voltage, frequency, electrical noises, blackouts and mains faults, which are present in the energy distribution lines. This is the main target of the UPSs from **SLC TWIN PRO** series.

This manual can be applied to the standardised and stated models in table 1.

3.3.1. Main features.

- True on-line double conversion and independent output frequency from mains.
- Output power factor of 0,9 and pure sinewave, suitable for almost any kind of loads.
- Input power factor > 0,99 and high general efficiency (> 0,92 for single phase input or > 0,93 for three phase). High energy saving and low cost for the user's installation (wiring) is achieved, as well as low input current distortion, so mains pollution is decreased.
- Great adaptability to the worst conditions of the input mains. Wide margins of the input voltage, frequency range and wave shape, so it is avoided the excessive dependence on the limited energy of the battery.
- Availability of battery chargers up to 12A in order to decrease the battery recharging time.
- Parallel redundant connection N+X to increase the reliability and flexibility. 4 equipments in parallel as maximum.
- High efficiency mode can be selected > 0,97 (ECO-MODE). Energy saving, which reverts to the user in an economy way.
- It is possible to start up the equipment without mains or the battery discharged. Watch this last aspect, because the back up time will be decreased as much discharged the batteries are.
- The technology of the smart management of the battery is very useful for making longer the accumulator lifetime and to optimise the recharging time.
- Standard communications options by means of RS-232 or USB ports.
- Control of the remote emergency power off (EPO).
- Control signal of the remote emergency power off (EPO).
- Interface between the user and the equipment through the control panel and LCD with led indicators, user friendly.
- Option cards are available to improve the communication capacity of connectivity.
- Easy firmware updating, no need to call to the Service and Technical Support (**S.T.S.**).
- Simplified maintenance, which allows replacing the batteries in a safety way without shutdown the UPS.

Model	Type	Input / output tipology
SLC-4000-TWIN PRO	Standard	Single phase / Single phase
SLC-5000-TWIN PRO		
SLC-6000-TWIN PRO		
SLC-8000-TWIN PRO		
SLC-10000-TWIN PRO		
SLC-8000-TWIN/3 PRO		Three phase / Single phase
SLC-10000-TWIN/3 PRO		
SLC-12000-TWIN/3 PRO		
SLC-15000-TWIN/3 PRO		
SLC-20000-TWIN/3 PRO		
SLC-4000-TWIN PRO(B0)	No batteries	Single phase / Single phase
SLC-5000-TWIN PRO(B0)		
SLC-6000-TWIN PRO(B0)		
SLC-8000-TWIN PRO(B0)		
SLC-10000-TWIN PRO(B0)		
SLC-8000-TWIN/3 PRO (B0)		Three phase / Single phase
SLC-10000-TWIN/3 PRO (B0)		
SLC-12000-TWIN/3 PRO (B0)		
SLC-15000-TWIN/3 PRO (B0)		
SLC-20000-TWIN/3 PRO (B0)		
SLC-4000-TWIN PRO(B1)	Extender back up time	Single phase / Single phase
SLC-5000-TWIN PRO(B1)		
SLC-6000-TWIN PRO(B1)		
SLC-8000-TWIN PRO(B1)		
SLC-10000-TWIN PRO(B1)		
SLC-8000-TWIN/3 PRO (B1)		Three phase / Single phase
SLC-10000-TWIN/3 PRO (B1)		
SLC-12000-TWIN/3 PRO (B1)		
SLC-15000-TWIN/3 PRO (B1)		
SLC-20000-TWIN/3 PRO (B1)		

Table 1. Standard models.

3.4. Options.

Depending on the selected configuration, the equipment can include any of the following options:

3.4.1. Isolation transformer.

The isolation transformer, provides a galvanic isolation that allows isolating the output from the input completely.

The installation of an electrostatic shield between the primary and secondary windings of the transformer provides a high level of attenuation of the electrical noises.

The isolation transformer can be installed at the input or output of the UPS from **SLC TWIN PRO** series and it will always be located out from the equipment enclosure.

3.4.2. Externalmaintenancemanualbypass.

The purpose of this option is to isolate electrically the equipment from mains and critical loads, without breaking the power supply to the loads. Therefore, in this way the maintenance or fixing tasks can be done in the equipment with no interruption on the power supply energy to the protected system, at the same time that unnecessary risks are avoided to the technical staff.

The basic difference between this option and the manual bypass integrated in the own UPS enclosure consists in a better manoeuvring, because it allows a complete disconnection of the UPS from the installation.

3.4.3. IntegrationinITnetworksbymeansofthe SNMP adaptor.

The big IT systems based on LANs and WANs that integrate servers with different platforms, they have to include an easy way of controlling and management at the manager system disposal. This facility is got through the SNMP adaptor, which is well-known by the main software and hardware manufacturers.

The available SNMP option for **SLC TWIN PRO** series is a card to be inserted into the slot that the UPS has in its rear side.

The connection of the UPS with the SNMP is internal meanwhile the connection between the SNMP and the IT network is done through a RJ45 connector 10 base.

3.4.4. AS400 card.

See section 4.3.8.4.

3.4.5. Parallel cable.

It is the used parallel cable to make the parallel communication among all the equipments that makes a system.

All models from **SLC TWIN PRO** series already include the parallel kit as standard. In case, it is needed to upgrade the power of the equipment or to get redundancy by paralleling more equipments of the same power, this cable will be needed.

3.4.6. MODBUS protocol.

The big IT systems based on LANs and WANs, many times they require that the communication with any device to be integrated in the IT network has to be done by means of an industrial standard protocol.

One of the most used industrial standard protocols in the market is the MODBUS protocol. **SLC TWIN PRO** series is also ready to be integrated in this type of environments through the external “Winpower CMC card” device with MODBUS protocol.

4. Installation.

- Check the Safety instructions, from section 1.2.3.
- Check that the data in the nameplate are the required by the installation.
- A wrong connection or manoeuvring, can make faults in the UPS and/or loads connected to itself. Read carefully the instructions of this manual and follow the stated steps in the established order.
- This UPS has to be installed by qualified staff and it can be used by personnel with no specific training, just with the help of this «Manual» only.
- All connections of the equipment including the control (interface, remote panel, ...), will be done with the switches at rest and no voltage present (UPS power supply switch to «Off»).
- Never forget that the UPS is an electrical energy generator, so the user has to take the needed cautions against direct and indirect contacts.
- When there is only one equipment, omit all the instructions and their implicit connections as regards to parallel systems.
- Parallel system installation needs a switchgear panel with input, output and static bypass single protections (the last one for **TWIN/3 PRO** models higher than 10 kVA only), and a manual bypass too.

  This switchgear panel allows isolating only one equipment from the system, when facing any malfunctioning and supplying the loads with the rest of equipments during the preventive maintenance or during the reparation of itself.

  Under request a manual bypass panel can be supplied for a single equipment or a particular system.
- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.
- Battery circuit is not isolated from input voltage. Hazardous voltages can be found out between the battery terminals and earth. Check that there is not input voltage before doing any intervention on them.

4.1. Tobeconsideredintheinstallation.

- All the equipments and battery sets have terminals as connection parts for power and connectors for communications.
- Terminals for separate bypass line are only available in **TWIN/3 PRO** models higher than 10 kVA.
- Cross cable section of the input and output lines, will be calculated from the currents stated in the nameplate of each equipment, and respecting the Local and/or National Low Voltage Electrotechnical Regulations.

  For the bypass current stated in the nameplate, has to be considered two groups of equipments:

  ❒ Equipments up to 10 kVA **TWIN/3 PRO**. Current on phase R is higher to the other two, because the input of the UPS is common with the bypass line.

  ❒ Equipments > 10 kVA **TWIN/3 PRO**. These equipments have separate terminals for UPS input and bypass line.
- Protections of the switchgear panel, will have the following features:

  ❒ For input and bypass lines, type B for RCD devices and C characteristic for circuit breakers.

  ❒ For the output (load feeding), C characteristic for circuit breaker.

  Regarding the size, they will be as minimum to the currents stated in the nameplate of each UPS. Pay attention to the UPSs up to 10 kVA and three phase input, because a four pole switch has to be fitted in as input protection and a second one of two poles between this one and the own UPS, in order to protect the phase R and neutral.
- In the nameplate of the equipment there are only printed the nominal currents as it is stated in the safety standard EN-IEC 62040-1. To calculate the input current, the power factor and the efficiency of the equipment have been considered.

  Overload conditions are considered as nonpermanent and exceptional operating mode.
- If it is added peripherals to the input, output or bypass like transformers or autotransformers to the UPS, the currents stated in the own nameplates of those elements has to be considered in order to use the suitable cross sections, by respecting the Local and/or National Low Voltage Regulation
- When an equipment incorporates a galvanic isolation transformer, as standard, as an option or either installed by yourself, either at the UPS input, bypass line, output or at all of them, protections against indirect contact has to be fitted in (residual current device) at the output of each transformer, because due to its specification of isolation it will prevent the triggering of the protections fitted in the primary of the transformer in case of electrical shock in the secondary (output of the isolation transformer)
- Remind you that all external isolation transformers already installed or supplied from factory, has the neutral of the secondary connected to earth by means of a cable bridge between both terminals. If it were required an isolated output neutral, remove this cable bridge, keeping the precautions stated in the respective local and/or national low voltage regulations.
- All standard UPSs have batteries in the same enclosure of the equipment , less those ones as B0 and B1. In the first ones, the battery protection is by internal fuses and there is no access to the end-user.

  Accumulator cabinet or modules have battery protection too, and in this case, they are duplicated. An internal ones through fuses with no access for the end-user and an additional ones by means of a two pole circuit breaker.
- IMPORTANT FOR SAFETY: In case of installing the batteries by yourself, the accumulators have to be provided with a two pole circuit breaker protection sized to the features stated in table 2.

4.2. Reception of the equipment.

4.2.1. Unpacking and content checking.

- On receiving the device, make sure that it has not suffered any damage in transport (impact, drop, ...) and its features correspond with the ones in the order, so it is recommended to unpack the UPS and make a first visual inspection.
- In case of observing damages, make all pertinent claims to the transport agency or in their lack to our company.

Never start up an equipment when external damages can be observed.

- Also check that the data in the nameplate sticked in the packaging and in the equipment, correspond to the ones stated in the order, so it is required to unpack it (see section 4.2.3). Otherwise, make a nonconformity as soon as possible, by quoting the serial number of the equipment and references in the delivery note.
- Check the contents of the packaging:
  - ❒ The own equipment.
  - ❒ User's manual in computerised form (CD).
  - ❒ 1 communication cable.
  - ❒ 1 cable for connecting in parallel other equipments.
  - ❒ 1 female connector to make the external EPO connection, with a cable bridge to close the electrical.
  - ❒ A metallic cover for the parallel connections. This cover replaces to the one that device has as standard, which is completely flat.
- Once the reception is finished, it is advisable to pack the UPS again till its commissioning in order to protect it against mechanical shocks, dust, dirt, etc...

4.2.2. Storage.

- Storage of the equipment will be done in a dry place, safeguard from rain, protected from dust, water jets or chemical agents, never outdoors. It is advisable to keep the equipment and the battery pack/s, into their original packages, which have been designed to assure the maximum protection during the transport and storage.
- In general and other than in special cases, the UPS has sealed lead-calcium batteries and should not be stored for more than 12 months (see the date of the last charge of the batteries, noted on the label adhered to the device packaging or on the battery unit).
- After this time, connect the equipment to mains and together with battery unit, if any, start it up according to the instructions described in this manual and charge them for 2 hours from floating level.

  In parallel systems, it is not needed to make the connection among the equipments to charge the batteries. It can be treated as separate units to charge them.
- Finally, shutdown the equipment, disconnect it and fit the UPS and batteries in their original packaging, noting the new battery charge date on each respective label.
- Do not store the devices where the ambient temperature exceeds above 40ºC or below -20ºC, otherwise it may degrade the electrical characteristics of the batteries.

4.2.3. Unpacking and inspection.

- The packaging of the equipment consists of a wooden pallet, a cardboard or wooden packaging depending on the case, expanded polystyrene corner pieces, polyethylene sleeve and band, all of them are recyclable materials; therefore they should be disposed according to current regulations. We recommend that the packaging should be kept in case its use is necessary in the future.

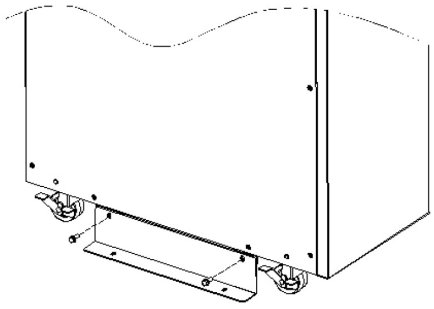


Fig. 8.

- Equipments with single phase input (**TWIN PRO**) or three phase input (**TWIN/3 PRO** up to 10 kVA).
  - ❒ To unpack the equipment, just follow the sequence from figure 4 to 6 (cut the bands on the cardboard packing and take it out through the top as it were a cover or remove it with the necessary tools if the packing is made of wood; remove the corner pieces and the plastic sleeve. The UPS will be naked over the pallet.
  - ❒ With the help of one or two people in each side of the UPS, download it from the wooden pallet.
- Equipments with three phase input (**TWIN/3 PRO** > 10 kVA).
  - ❒ To unpack the equipment, just follow the sequence from figure 4 to 6 (cut the bands on the cardboard packing and take it out through the top as it were a cover or remove it with the necessary tools if the packing is made of wood; remove the corner pieces and the plastic sleeve. The UPS will be naked over the pallet.

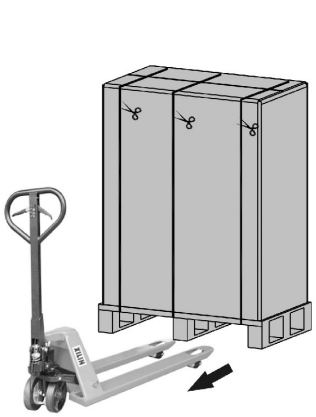


Fig. 4.

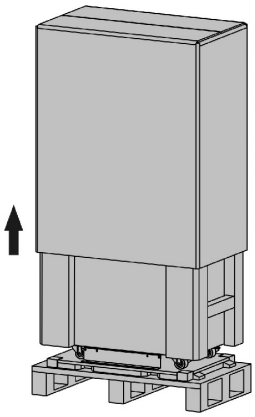


Fig. 5.

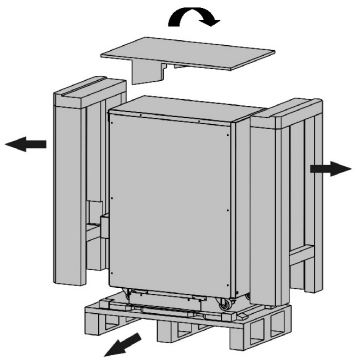


Fig. 6.

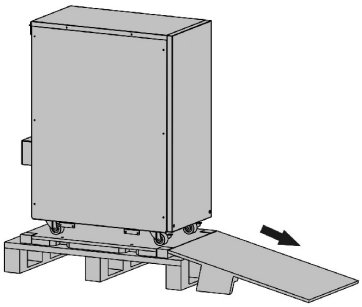


Fig. 7.

❒ Before downloading the equipment from the pallet, the stabilizer supports have to be removed (see figure 8), otherwise they will make difficult the process and they will be bent when impacting with the wooden ramp, making damages and the own case or cabinet structure of the equipment.

❒ Put the ramp as figure 7 and download the equipment from the pallet.

4.2.4. Transport to location.

- All equipments have four casters (two of them with brake), so it is easy to move it till the installation location once it is unpacked.

  Nevertheless, if the reception area is far from the installation place, it is recommended to move the UPS with a forklift or a suitable transport medium keeping in mind the distance between both points.

  If the distance is too long, it is better to move the equipment packed till the installation place and unpack it there.

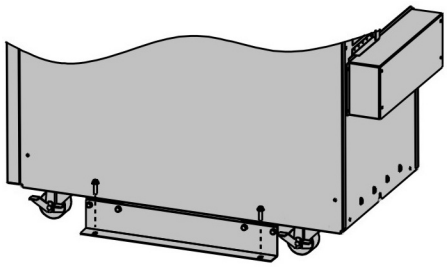


Fig. 9.

- If it is appropriated and as a preventive measure, the stabilizing supports can be reassembled (see Figure 8), to avoid the dump of the device. Optionally the equipment can be locked, by fixing it to the floor through the holes provided in the same support (see figure 9).

4.3. Connection.

- ⚠ Cross cable section used in the power supply of the equipment and loads to feed, will be sized according to the nominal current stated in the nameplate sticked on the equipment, by respecting the Low Voltage Electrotechnical Regulations or norms of the corresponding country.
- Installation will have the suitable input protections sized to the current of the equipment and stated in the nameplate of the equipment (residual current devices type B and circuit breaker with C characteristic or any other equivalent one).

  For equipment with three phase input, which are connected to a power distribution system type IT, the protection will be four poles in order to break the three phases and neutral in the same manoeuvring.

  Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.
- Output protection will be done with a circuit breaker of C characteristic or any other equivalent one.
- To make the power, control connections or insert the option cards, etc..., it is needed to remove the screws that fix each cover and the own covers.

  When finalising the corresponding tasks the cover/s and their fixing screws will be fitted back.
- It is recommended to use pointed terminals in all ends of the cables connected to the power blocks (input, output and bypass).
- Check the correct torque in the screws of the power blocks.
- ⚠ In installations with only one UPS, the "Jumper" (cable as bridge mode) connected from factory between the terminals **JP1** and **JP2** has to be kept as it is.

  For equipments connected in a parallel system, this "Jumper" has to be removed.

  Act according to the installation or otherwise the UPS or parallel system will not work.

4.3.1. Connection of input power block.

- ⚠ As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- In accordance with safety standard EN-IEC 62040-1, the installation has to be provided with a «Backfeed protection» system, as for example a contactor, which will prevent the appearance of voltage or dangerous energy at the input mains during a mains fault (see figure 10 and respect the circuit diagram of the particular «Backfeed protection» for the equipment with single phase input (**TWIN PRO**) or three phase input (**TWIN/3 PRO** up to 10 kVA)).

  ⚠ There can be no derivation in the line that goes from the «Backfeed protection» to the UPS, as the safety standard would be infringed.
- Warning labels should be placed on all primary power switches installed in places away from the device to alert the electrical maintenance personnel of the presence of a UPS in the circuit.

  The label will bear the following or an equivalent text:

> **Before working on this circuit.**
>
> - Isolate Uninterruptible Power System (UPS).
> - Then check for Hazardous Voltage between all terminals including the protective earth.
>
> ⚡ **Risk of Voltage Backfeed from UPS.**

- Connect the input cables to the respective power block depending on the configuration of the equipment (see figure 11).

  Connection in a single phase input (TWIN):

  Connect the power supply cables to input power blocks **R (L)** and **N**, **by respecting the rotation of phase and neutral** stated in the labelling of the equipment and in this manual. If this rotation is not respected there could be fault/s and/or anomalies.

  When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

  Connection in a three phase input (TWIN/3 PRO):

  The described connection instructions are valid for all **TWIN/3 PRO** equipments, being the only difference the connection of the «Backfeed protection», which depending on the power it will be connected in the three phase input (**TWIN/3 PRO** up to 10 kVA) or in the bypass line (**TWIN/3 PRO** > 10 kVA).

Connect the power supply cables to input power blocks **R (L1)**, **S (L2)**, **T (L3)** and **N**, **by respecting the phase rotation and neutral** stated in the labelling of the equipment and in this manual. If this rotation is not respected, the equipment will not work. A wrong connection between the neutral and one phase will make serious or very serious faults.

When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.

4.3.2. Connection of bypass power block. TWIN/3 PRO > 10 kVA only.

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth( )). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- In accordance with safety standard EN-IEC 62040-1, the installation has to be provided with a «Backfeed protection» system, as for example a contactor, which will prevent the appearance of voltage or dangerous energy at the bypass line during a mains fault (see figure 10 and respect the circuit diagram of the particular «Backfeed protection» for the equipment with three phase input (**TWIN/3 PRO** > 10 kVA)).

  There can be no derivation in the line that goes from the «Backfeed protection» to the UPS, as the standard safety would be infringed.

  The control signal of the external contactor for «Backfeed protection» is done through the terminals of the own UPS (MC/coil. out and MC/coil. in).

Operating:

If bypass thyristor is short-circuited and the UPS is working on double conversion mode (On-Line), the «Backfeed protection» contactor will break the bypass line and the message «Backfeeder» will be displayed in the LCD panel.

Reset.

To restore the logical control of «Backfeed protection», the UPS has to be shutdown for a few seconds, and start it again and acknowledge the alarm in the control panel (see chapter 6).

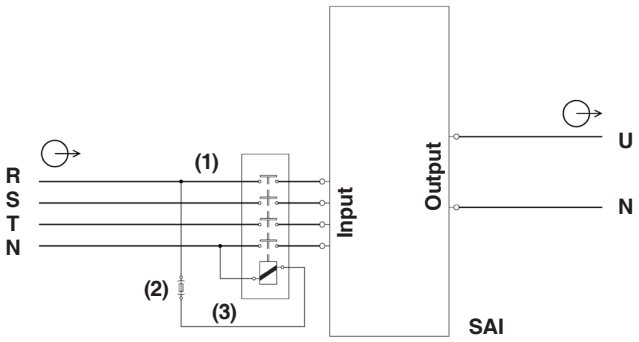
- Warning labels should be placed on all primary power switches installed in places away from the device to alert the electrical maintenance personnel of the presence of a UPS in the circuit.

  The label will have the following text or an equivalent one:

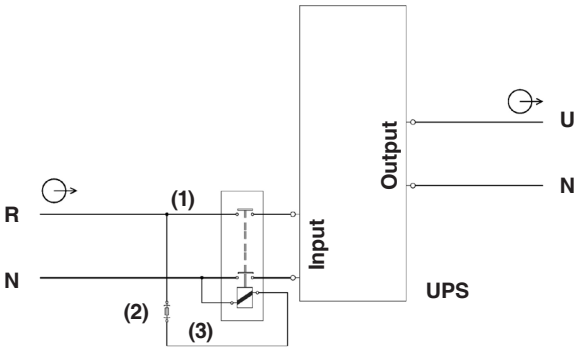
Before working on this circuit.

- Isolate Uninterruptible Power System (UPS).
- Then check for Hazardous Voltage between all terminals including the protective earth.

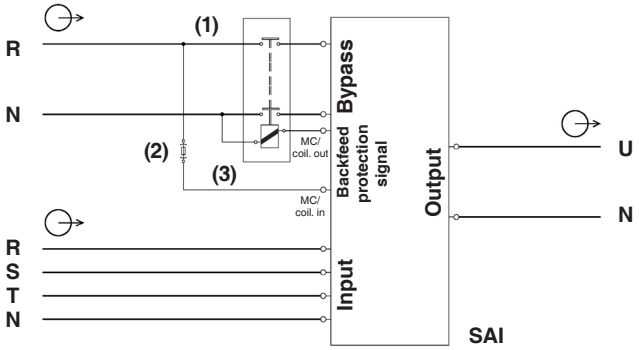
Risk of Voltage Backfeed from UPS.



«Backfeed protection» connection in TWIN/3 PRO up to 10 kVA.



«Backfeed protection» connection in TWIN PRO.



«Backfeed protection» connection in TWIN/3 PRO > 10 kVA.

(1) Automatic «Backfeed protection» protection system, external to the UPS (EN-IEC 62040-1).

(2) Fuse holder and fuse for general purpose of 250V AC / 3A type F.

(3) Two poles contactor of 230V AC with a minimum distance between contact of 1,4 mm and coil of the same voltage, with the minimum current stated in the nameplate of the UPS (input or bypass according to).

For parallel systems, each equipment must have its own "Backfeed protection" completely independent.

Fig. 10. "Backfeed protection" circuit diagram.

- Connect the power supply cables to bypass power blocks **R (M2)** and **N**, **by respecting the rotation of phase and neutral** stated in the labelling of the equipment and in this manual (see figure 11). If this phase, neutral rotation is not respected there will be serious fault/s in the equipment.

  When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.

- In equipments with separate bypass line, a galvanic isolation transformer has to be installed in any of the two lines that supply the UPS (rectifier input or static bypass), to avoid the direct union of the neutral of both lines through the internal wiring of the equipment .

  This is applicable when the two lines are supplied from different mains, i.e.:

  ❒ Two different electrical companies.

  ❒ An electrical company and genset, ...

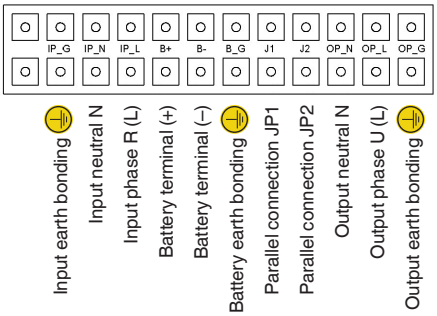
4.3.3. Connection to output power block.

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- Connect the loads to output power block **U (L)** and **N**, **by respecting the phase and neutral rotation** stated in the labelling of the equipment and this manual (see figure 11).

  When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.
- With respect to the protection that must be placed at the output of the UPS, we recommend that the output power should be distributed in at least four lines. Each one should have a circuit breaker protection switch of a value of one quarter of the nominal power. This type of power distribution will allow that in the event of a breakdown in any of the machines connected to the device causing a short-circuit, it will affect to no more than the line that is faulty.

  The rest of the connected loads will have their continuity assured due to the triggering of the protection, because the line affected by the short-circuit will trip its protection.



UPS connection power block (TWIN PRO).

Fig. 11. Connection power block.

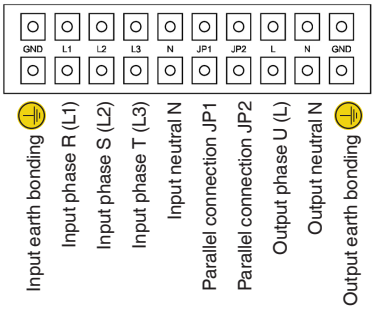
4.3.4. Connection of external batteries (extended back up times).

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- **To not respect the stated indications in this section and the safety instructions 1.2.3 means a high risk of electrical discharge and even the death.**

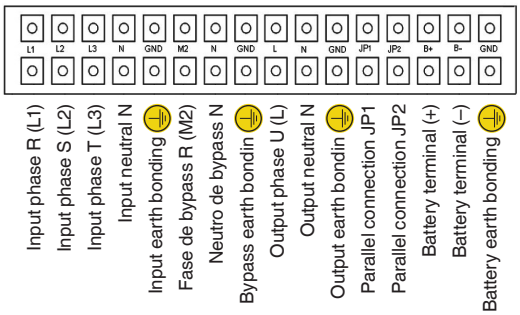
Model	Batteries (U_{cell} x Nº) = $U_{nominal}$ / $U_{floating}$	Minimum features of two poles protection switch	
		Voltage DC (V)	Current (A)
SLC-4000-TWIN PRO	(12 V x 20) = 240V / 275V	440	20
SLC-5000-TWIN PRO			25
SLC-6000-TWIN PRO			32
SLC-8000-TWIN PRO			40
SLC-10000-TWIN PRO			50
SLC-8000-TWIN/3 PRO	(12 V x 24) = 288V / 330V	440	40
SLC-10000-TWIN/3 PRO			50
SLC-12000-TWIN/3 PRO			50
SLC-15000-TWIN/3 PRO			63
SLC-20000-TWIN/3 PRO			100

Table 2. Features of protection between the equipment and battery cabinet.

- All standard UPSs have batteries in the same enclosure of the equipment , less those ones as B0 and B1. In the first ones, the battery protection is done by internal fuses and there is no access to the end-user.



UPS connection power block (TWIN/3 PRO up to 10 kVA).



UPS connection power block (TWIN/3 PRO > 10 kVA).

Accumulator cabinet or modules have battery protection too, and in this case, they are duplicated. An internal ones through fuses with no access for the end-user and an additional ones by means of a two pole circuit breaker.

- IMPORTANT FOR SAFETY: In case of installing the batteries by yourself, the accumulators has to be provided with a two pole circuit breaker protection sized to the features stated in table 2.
- **Before starting the connection between the battery module/s and the equipment, check that the equipment switch/es and the one in the battery cabinet are in "Off" position.**
- Connection terminals with the external batteries are in the same power block of the equipment, less in **TWIN/3 PRO** up to 10 kVA, which have an Anderson connector.
- Connection of the UPS with the battery cabinet will be done by means of a supplied bundle cables, connecting, at first stage, one of the ends to the power block or Anderson connector of the UPS and then the other end to the power block or Anderson connector of the battery cabinet, by respecting the polarity stated in the labelling of the equipment and this manual, and colour of the cables (red for positive, black for negative, green-yellow for earth).

  Battery modules with Anderson connector there is no possibility to make a mistake in the polarity.

  Table 3 states the battery connection type, which are available in the UPS and battery modules.

Model	Battery connection terminals	
	In the UPS	In the external battery module
SLC-4000-TWIN PRO	Power block	Anderson connector
SLC-5000-TWIN PRO		
SLC-6000-TWIN PRO		
SLC-8000-TWIN PRO		Power block
SLC-10000-TWIN PRO		
SLC-8000-TWIN/3 PRO	Anderson connector	Anderson connector
SLC-10000-TWIN/3 PRO		
SLC-12000-TWIN/3 PRO	Power block	Power block
SLC-15000-TWIN/3 PRO		
SLC-20000-TWIN/3 PRO		

Table 3. Type of connection terminals in the UPS and battery module.

- When it is supplied more than one battery unit for each equipment, the connection will always be done in parallel between them and the equipment. So it means, black cable from negative of the UPS to the first negative of the first battery module and from this last negative to the second module and so on. Proceed in the same way to connect the red positive cable and the green-yellow earth cable.
- In parallel systems, the connection of each equipment with its external battery cabinet/s has to be done like if they were single units, completely separate from the rest ones.
- Each battery module is independent for each equipment. **It is strictly prohibited to connect two equipments to one battery module**.

4.3.5. Connection of main input earth terminal ( ) and the earth bonding terminal ( ).

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth ( )). Connect the conductor to the terminal or bar, before connecting the power supply to the UPS input.
- Make sure that all the loads connected to the UPS are only connected to the protective earth bonding terminal ( ). The fact of not restricting the earthing of the load or loads and/or the batteries case/s or cabinet/s to this **single point** will create a return loops to earth which will affect the quality of the supplied power .
- All terminals identified as earth bonding ( ), are joined together, to the main protective earthing terminal ( ) and to the frame of the device.

4.3.6. Terminals for EPO (Emergency Power Off).

- All UPSs have a terminal strip to install an external button, for Emergency Power Off (EPO).
- The equipment is preset from factory with the EPO as normally open contact. So, the UPS will break the output power supply when the circuit is open:
  - ❒ Either by removing the female connector inserted in the plinth. This connector has a cable bridge to close the circuit (Fig. A).

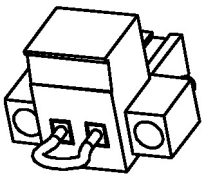


Fig. A

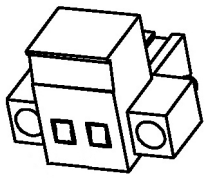


Fig. B

  - ❒ Or by turning on the external button installed and belonging to the end-user. The connection in the button has to be in normally closed because it will open the circuit when turning it on.
- Through the control panel, it can be selected the reverse functionality, normally closed.

  Less punctual cases, it is not recommended to use this type of connection due to the function of the EPO button, because it would not work in case of any of the two cables that goes from the button to the UPS were cut (damaged).

  On the other hand this failure would be immediately detected in the normally open EPO type, with the inconvenience of the sudden break in the power supply to the loads, but with a complete guarantee of the functioning of the emergency power off.
- To restore the normal operating mode of the UPS, the connector with the cable bridge has to be fitted back in the terminal strip or to deactivate the EPO button and later on to cancel the EPO status in the control panel . The equipment will be operative.

4.3.7. Connection in parallel.

4.3.7.1. Introduction to the redundancy.

N+X is usually the most reliable power structure. N means the minimum quantity of equipments that the total load needs; X means the quantity of redundant equipments, so it means, the quantity of faulty UPSs that the system can allow at the same time. As higher is X, the highest will be the reliability of the system. For those cases where the reliability is the most important point, N+X will be the optimal mode.

Up to 4 equipments can be connected in parallel to set a share and redundant output in power.

4.3.7.2. Installation and parallel operating.

- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- **Parallel connection bus**. Use the bundle with 25 signal cables with mesh and DB25 connectors in the ends to joint up to 4 equipments as maximum. Each bundle has a male and female connector in the ends, which have to be connected in the correlative equipments. It is essential to close the loop of the parallel bus.

  The length of the parallel cable has 3 metres and it can't be extended under any other concept due to the risk of interferences and communication failures that it could cause.
- In those installations with only one UPS, the “Jumper” (cable as bridge mode) connected from factory between the terminals **JP1** and **JP2** has to be kept in this place.

  For equipments connected in a parallel system, this “Jumper” has to be removed.

  Proceed according to your installation or otherwise the UPS or parallel system will not work.
- The installation of the parallel systems, has to be provided by a switchgear panel with individual protections for input, output, static bypass (this last one for **TWIN/3 PRO** > 10 kVA models only), also a manual bypass with mechanical lock, see figures 12 and 13.

  This switchgear panel allows isolating only one equipment from the system, against any failure and feed the loads with the rest of equipments during the preventive maintenance or its fixing. In the same way, it allows removing an equipment in parallel and replace it or put it in parallel again once it is fixed, but without breaking the power supply to the loads.

  Under request a manual Bypass panel can be supplied for a single equipment or particular system.
- Regarding the protection panel, it is better to size it for future foreseen upgrading. This way, both the installation of any new UPS in the parallel system is easier, and the risks due to electrical discharge are minimized because the low voltage panel is manoeuvred for those cases that it is not possible to shutdown the loads.
- Respect the connection procedure for input and bypass (**TWIN/3 PRO** > 10 kVA) described in the previous sections of this chapter.
- Respect the established procedure to make the connection of the battery modules for those equipments with extended back up time, which has been described in the previous sections of this chapter.
- Respect the established procedure to make the connection of the output (loads), which has been described in the previous sections of this chapter.

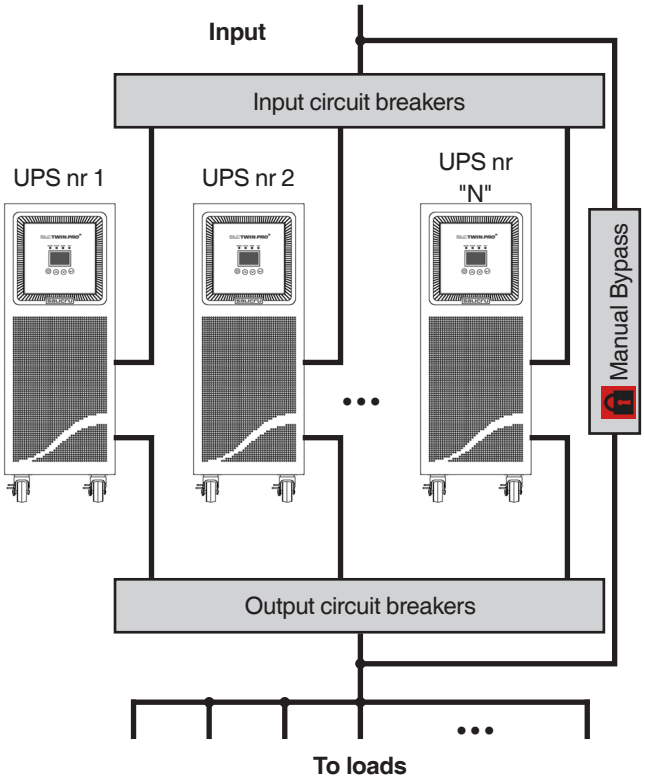


Fig. 12. Parallel installation of TWIN PRO and TWIN/3PRO UPS's up to 10 kVA, with protection and manual bypass panel.

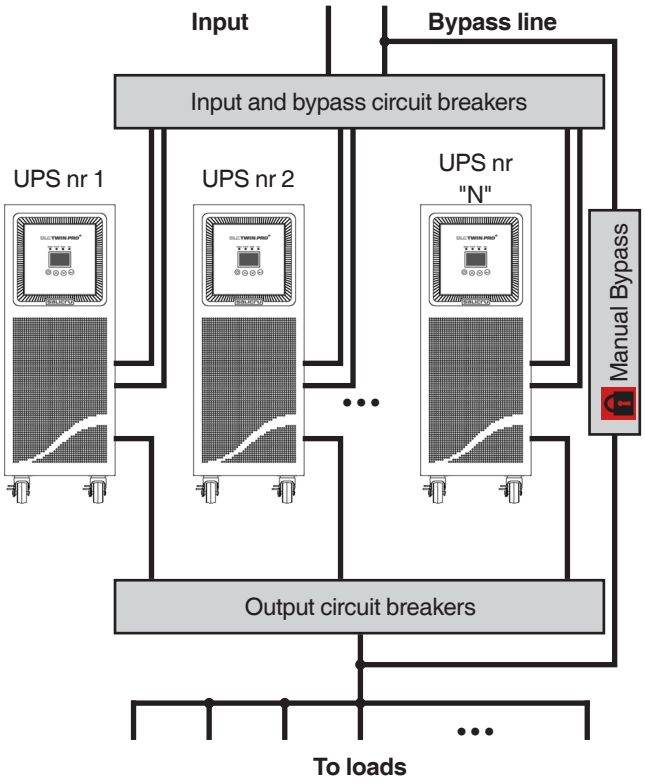


Fig. 13. Parallel installation of TWIN/3PRO series > 10 kVA, with manual bypass and protection panel.

- Respect the established procedure to make the connection of the output and batteries of the equipment, which has been described in the previous sections of this chapter.

- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.

  In the worst case, the following deviations have to be strictly respected:

  - ❒ When the distance among the UPSs and the protection panel is lower than 20 metres, the difference in the length between the input and output cables of the equipments has to be lower than 20%.
  - ❒ When the distance among the UPSs and the protection panel is higher than 20 metres, the difference in the length between the input and output cables of the equipments has to be lower than 10%.

4.3.8. Communication ports.

4.3.8.1. RS232 and USB interfaces.

- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- RS232 and USB interfaces are used by the monitoring software and firmware updating.
- It is not possible to use both ports at the same time.
- Signal pin-out of the DB9 connector are shown in table 4.

  RS232 port consists in a serial data transmission, so an important quantity of information can be sent through a communication cable of three wires.
- Physical structure of RS-232:

Pin #	Description	Input / Output
2	TXD (serial data transmission)	Output
3	RXD (serial data reception)	Input
5	GND (groundof the signal)	Input

Table 4. Pin-out of the RS232 in the DB9 connector.

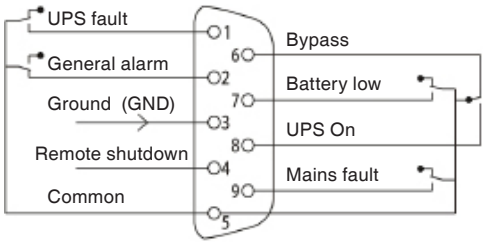
- USB communication port is compatible with the USB 1.1 protocol for communication software.

4.3.8.2. Standard relays interface. DB9 connector.

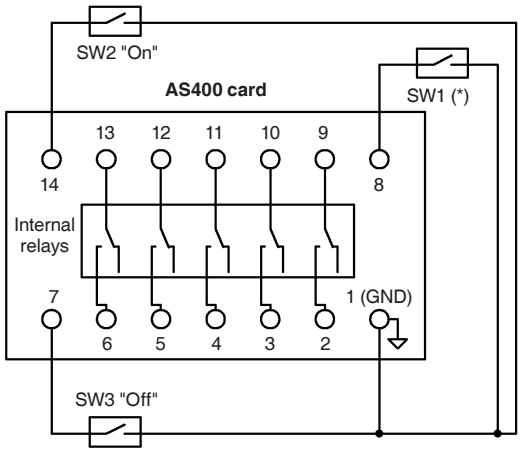
- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- UPS has a relays interface, it provides digital signals in a free potential way, with a maximum applicable voltage and current of 120 V ac or 24 V dc and 1A. Signal pin-out of the DB9 connector are shown in figure 14 and detailed in the table 4.

4.3.8.3. Smart slot.

- UPSs have a unique slot for TWIN PRO and two slots for TWIN/3 PRO, hidden rear the covers stated in the views of the equipment. One of them allows inserting the WebPower card option, for controlling it via Web, and the second, which is also optional, allows the remote management of the UPS through Internet or Intranet.
- For more information, contact with our **S.T.S.** or our nearest distributor.



DB9 connector, standard.



AS400 connector, optional.

Fig. 14. Relays interface pin-out.

Description	Nr pin	Input/output
UPS fault	1	Output
General alarm	2	Output
Ground (GND)	3	Input
Remote shutdown	4	Input
Common	5	Input
Bypass	6	Output
Batería low	7	Output
UPS On	8	Output
Mains fault	9	Output

DB9 connector, standard.

Description	Nr pin	Input/output
Mains fault	Programmable	Output
Low battery	Programmable	Output
General alarm	Programmable	Output
Bypass status	Programmable	Output
Summary alarm	Programmable	Output
Battery test	Programmable	Output
Shutdown in process	Programmable	Output
Overload alarm	Programmable	Output
UPS signal "On"	1 (GND) - 14	Input
UPS signal "Off"	1 (GND) - 7	Input
Programmable signal as: - EPO - Shutdown on battery mode - Shutdown on any mode - Remote control "On-Off"	1 (GND) - 8	Input

AS400 connector, optional.

Table 5. Relays interface alarms.

4.3.8.4. AS400 interface (option).

- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- UPS has a dry contact card for the AS400 communication protocol, it provides digital signals in a free potential way, with a maximum applicable voltage and current of 240 V ac or 30 V dc and 1A.
- This communication port makes possible the dialogue between the equipment and other machines or devices, through the 5 dry contacts supplied in the terminal strip included in the same card and to each one of them an alarm of the 8 available can be assigned (see table 5).

  Also there are other three additional terminals with only one common, for an installation of an external On/Off switch to the equipment and a third one with free setting among EPO, Shutdown or "On-Off" remote control.

  From factory all contacts are normally opened, being able to set them separately one by one, by means of the Hyper Terminal software or equivalent.
- The most common use of this type of ports is to provide the needed information for the closing file software.
- This card has a RS232 port through a RJ connector. So, in case of requiring a DB9 connector, use the adaptor RJ / DB9 supplied with the AS400 card.
- For more information, contact with our **S.T.S.** or our nearest distributor.

Installation.

- Remove the protection cover from the AS400 slot of the equipment.
- Take the AS400 card and insert it into the reserved slot. Make sure that it is well connected, so the resistance that the own connector inside the slot makes has to be overcome.
- Make the needed connections in the alarm terminal strip.
- Put the new protection cover that it is supplied with the AS400 card and fix it through the same screws that fixed the original cover.

4.3.9. Software.

- **Free software download - WinPower.**

  WinPower is a UPS monitoring software, which makes a user-friendly interface of monitoring and management. This software supplies an auto Shutdown for a system based on several PCs in case of an electrical blackout. With this software, the end-users can monitor and manage any UPS in the same IT network, through the RS232 or USB communication port, never mind the distance between them.
- **Installation procedure:**
  - ❒ Go to website:

    http://support.salicru.com
  - ❒ Choose the operating platform that you need and follow the instructions described in the web site to download the software.
  - ❒ When downloading the needed files from Internet, enter the following licence to install the software:

    511C1-01220-0100-478DF2A .

  When the computer is rebooted, WinPower software will be shown as an icon with plug shape and green colour in the system tray, near the clock.

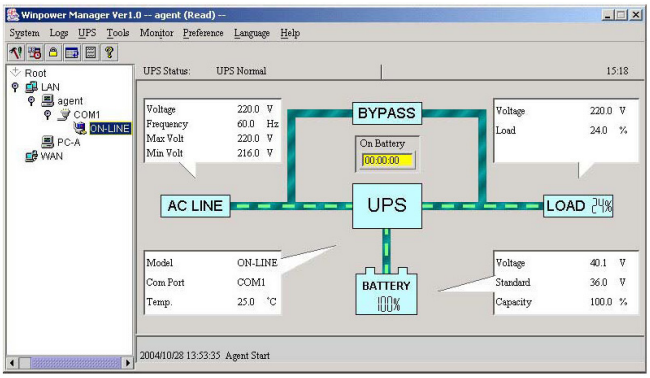


Fig. 15. Main screen of the monitoring software.

4.3.10. Considerations before starting up the connected loads.

- It is recommended to charge the batteries for 8 hours as minimum before using the UPS for first time.
  - ❒ For models with single phase input (**TWIN PRO**) or three phase (**TWIN/3 PRO up to 10 kVA**):

    It will be necessary to supply power supply voltage to the equipment and turn "On" the circuit breaker switch on the back **M1**. The battery charger will be started up automatically.
  - ❒ For models with three phase input (**TWIN/3 PRO > 10 kVA**):

    Supply voltage to the input and bypass terminals of the equipment. Turn "On" the circuit breakers switches on the back **M1** and **M2** and check that the neutral switch N is in "On" position. Battery charger will work automatically.
  - ❒ For external battery modules:

    Also for those models with batteries or extended back up time modules external to the equipment, the battery circuit breaker of each cabinet has to be turned "On".
- Although the equipment can work without charging the batteries during the stated 8 hours without any problem, the risk of a long blackout has to be valued during the first operating hours and the available autonomy time in the UPS.
- Do not start up the equipment and loads completely till chapter 6 states it.

  Nevertheless, when it is done, it will be done gradually to avoid any problem, as minimum in the first commissioning.
- If inductive loads with big inrush current apart from sensitive ones are required to be connected like laser printers or CRT monitors, keep in mind the start inrush currents of these peripherals in order to avoid that the equipment becomes blocked under the worst conditions.

5. Operating.

5.1. Commissioning.

5.1.1. Controls before commissioning.

- Make sure that all the connections have been made properly and are sufficiently tight, respecting the labelling of the equipment and the instructions of chapter 4.
- Check that the UPS switches and batteries cabinet/s are turned off (position «Off»).
- Be sure that all the loads are turned «Off».

  Turn off the connected loads before starting up the UPS , and start up the loads one by one, when the UPS is started up only. Before shutdown the UPS, check all the loads are out of service (Off).
- It is very important to proceed in the established order.
- For UPS view, see figures 1 to 3.
- Figures 12 and 13 shows a manual bypass panel for a parallel system, in a conceptual way, valid for a single equipment by adapting the quantity of switches.

5.2. Start up and shutdown of the UPS.

5.2.1. Start up of the UPS, with mains present.

- Check that the power supply connection is correct.
- Check that the battery switch is in position "On" (models B0 and B1).
- Turn the input (M1) and bypass **(M2)** circuit breakers to "On". Switch **(M2)** is only available in models (**TWIN/3 PRO** > 10 kVA).
  - ❒ In equipments with single phase input (**TWIN PRO**), turn the two poles switch **(M1)** to "On".
  - ❒ In equipments with three phase input (**TWIN/3 PRO** up to 10 kVA), turn the four poles switch **(M1)** to "On".
  - ❒ In equipments with three phase input (**TWIN/3 PRO** > 10 kVA), turn the three poles switch **(M1)** and the single pole **(M2)** to "On".

  Fan/s depending on the model, will be started up and the LCD panel will show the "SALICRU" brand logo .

  Next, the main screen will be displayed after the equipment test.
- Press over the start up key ⏻ for more than 1 second, the acoustic alarm will beep for 1 sec. and the UPS will start up.
- After a few seconds, the UPS establishes on "Normal mode". If the mains voltage is wrong, the UPS will transfer to "Battery mode", without breaking the feeding at the output power blocks.
- Start up the load/s, do not overload the equipment.

5.2.2. Start up of the UPS, without mains.

- Check that the battery switch is in position "On" (models B0 and B1).
- Turn the input (M1) and bypass **(M2)** circuit breakers to "On". Switch **(M2)** is only available in models (**TWIN/3 PRO** > 10 kVA).
  - ❒ In equipments with single phase input (**TWIN PRO**), turn the two poles switch **(M1)** to "On".
  - ❒ In equipments with three phase input (**TWIN/3 PRO** up to 10 kVA), turn the four poles switch **(M1)** to "On".
  - ❒ In equipments with three phase input (**TWIN/3 PRO** > 10 kVA), turn the three poles switch **(M1)** and the single pole **(M2)** to "On".
- Press over the start up key ⏻ for more than 1 second, the acoustic alarm will beep for 1 sec. and the UPS will start up.

  Fan/s depending on the model, will be started up and the LCD panel will show the "SALICRU" brand logo.

  Next, the main screen will be displayed after the equipment test.
- After a few seconds, the UPS establishes on "Battery mode". If the mains is restored, the UPS will transfer to "Normal mode", without breaking the feeding at the output power blocks.
- Start up the load/s, do not overload the equipment.

5.2.3. UPS shutdown, with mains present.

- Shutdown the load/s.
- Press over the start up key ⏻ for more than 3 seconds to shutdown the inverter. The acoustic alarm will beep for 3 sec. The equipment will be established on "Bypass mode".
- When finishing the previous action, there is still voltage at the UPS output.

  To break the power supply at the UPS output , turn "Off" the circuit breakers at the back of the equipment:
  - ❒ In equipments with single phase input (**TWIN PRO**), turn the two poles switch **(M1)** to "Off".
  - ❒ In equipments with three phase input (**TWIN/3 PRO** up to 10 kVA), turn the four poles switch **(M1)** to "Off".
  - ❒ In equipments with three phase input (**TWIN/3 PRO** > 10 kVA), turn the three poles switch **(M1)** and the single pole **(M2) to** "Off".

  or just turn "Off" the protections in the UPS protection panel.

  After a few seconds the screen is shutdown and the equipment will be out of service completely.

5.2.4. UPS shutdown, without mains.

- Shutdown the load/s.
- Press over the start up key ⏻ for more than 3 seconds to shutdown the inverter. The acoustic alarm will beep for 3 sec. The equipment will leave the output power blocks without voltage.

  After a few seconds the screen is shutdown and the equipment will be out of service completely.

5.3. Operative for a parallel system.

- The following operative, it is considered for equipments with the configuration preset from factory.
- Check that the load/s and output circuit breakers switches from protection panel, are in position "Off".
- Turn "On" the following circuit breaker switches:
  - ❒ All the input switches from protection panel.
  - ❒ The input ones of each UPS.
  - ❒ In equipments with static bypass line (**TWIN/3 PRO** > 10 kVA), the bypass ones from protection panel.
  - ❒ In equipments with static bypass line (**TWIN/3 PRO** > 10 kVA), the bypass ones of each UPS.

  UPSs supply output voltage through the bypass. Check the LCD from control panel, in case there was any warning or error information. Check the output voltage at the power blocks of each UPS separately, in order to check the voltage difference is below 1V among them. If the difference is higher than 1 V, double check the wiring and associated instructions.
- Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up. All UPSs will transfer to "Normal mode".

  Measure the output voltage on each UPS separately, to check the voltage difference is under 0,5 V. In case the difference were higher than 1 V, the UPSs have to be set (contact with the **S.T.S.**).
- Press over the start up key ⏻ for more than 3 seconds in any UPS and all of them will be shutdown, at the output will be voltage supplied through the bypass.

  Turn “On” the output circuit breaker switches from the distribution panel and the complete parallel system will supply output voltage through the bypass.
- Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up., finally the parallel system will be working on "Normal mode”
- Start up the load/s.

5.4. How to integrate a new UPS in an operating parallel system.

- The descriptions hereby detailed are referred to the integration of one equipment. For two equipments, the tasks to make are the same less the quantity of units and connections. Proceed accordingly.
- Attend the instructions stated in section 4.3.7.2, for parallel connection.
- Protection panel must have the corresponding input, output and static bypass switches (the last one in **TWIN/3 PRO** > 10 kVA version only), and also the manual bypass.
- Due to it is needed to modify the own parallel bus connection, in order to integrate the new equipment into the system (wiring bundle with DB25 connectors), the load feeding will have to be transferred to manual bypass.

  Proceed as follows:
  - ❒ Press over the key ⏻ in any UPS for more than 3 seconds to shutdown all the inverters. The acoustic alarm will beep for 3 seconds. The equipments that belong to the current parallel system will transfer to "Bypass mode".
  - ❒ Put all the equipments on manual bypass. To do it remove the cover from manual bypass switch, which is located at the back of each equipment and turn all the switches to position "BYPASS".
  - ❒ ⚠ Keep in mind that on "Bypass mode" or with the switch on position "BYPASS", the loads will be exposed to fluctuations of voltage, frequency and mains faults or blackouts, so in case it were possible choose one day with the lowest probability of faults (days without fluctuations, days without storms,...) and do it as fast as possible.
  - ❒ Turn the input and bypass circuit breaker protections (**TWIN/3 PRO** > 10 kVA) of each equipment to "Off".
  - ❒ Turn "Off" the output circuit breaker of the protection panel, corresponding to the new UPS to be integrated.
  - ❒ Disconnect the communication bus between the first and last equipment, and reconnect it including the new UPS. It is essential to close the bus loop to have a good operation.
- Turn "On" the following circuit breaker switches:
  - ❒ Each one from the input of each UPS.
  - ❒ In those equipments with static bypass line (**TWIN/3 PRO** > 10 kVA), also the bypass ones of each UPS.

  UPSs supply output voltage from bypass. Check the screen of the LCD from control panel in case there were any warning or error information.

  Measure the output voltage in the power blocks of the parallel system and in the output terminals of the new UPS, check the voltage difference is below 1 V. In case the difference were higher than 1 V, double check the wiring and associated instructions.
- Put back the cover of the manual bypass of each UPS.
- Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up. All UPSs will transfer to "Normal mode”.

  Measure the output voltage between the terminals **JP1** of the parallel system and terminals **JP1** of the new UPS, to check the voltage difference is under 0,5 V. In case the difference were higher than 1 V, the UPSs have to be set (contact with the **S.T.S.**)
- Press over the shutdown key ⏻ in any UPS for more than 3 seconds and each one will be shutdown, supplying output voltage through the bypass.

  Turn “On” the output circuit breaker switch of the distribution panel, corresponding to the new integrated equipment. The complete parallel system will supply output voltage, through the bypass.
- Remove the cover of the manual bypass in each UPS.
- Transfer the equipments with the manual bypass ("BYPASS" position) to position "UPS". Do it in the switches of all equipments.
- ⚠ Put back the protection cover of the manual bypass switch of all equipments, also check the torque of the fixing screws, otherwise any of the limit contacts could be activated and the manual bypass too.
- Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up, finally the parallel system will be working on "Normal mode”.

  Load/s are protected by the parallel system again.

5.5. How to replace a faulty UPS from the operating parallel system.

- ❒ Press over the key ⏻ in any UPS for more than 3 seconds to shutdown all the inverters. The acoustic alarm will beep for 3 seconds. The equipments that belong to the current parallel system will transfer to "Bypass mode".
- ❒ Put all the equipments on manual bypass. To do it remove the cover from manual bypass switch, which is located at the back of each equipment and turn all the switches to position "BYPASS".
- ❒ ⚠ Keep in mind that on "Bypass mode" or with the switch on "BYPASS" position, the loads will be exposed to fluctuations of voltage, frequency and mains faults or blackouts, so in case it were possible, choose one day with the lowest probability of faults (days without fluctuations, days without storms,...) and do it as fast as possible.
- ❒ Turn the input and bypass circuit breaker protections (**TWIN/3 PRO** > 10 kVA) of the distribution panel corresponding to the equipment to replace to "Off".
- ❒ Disconnect the communication bus of the faulty equipment and all power connections too, and remove it.
- ❒ Put the manual bypass switch of the new UPS, on "BYPASS" position. To do it remove the protection cover from manual bypass switch, which is located at the back of the equipment to connect.
- ❒ Place the new equipment instead of the faulty one and reconnect it. Attend the stated instructions in section 4.3.7.2, for parallel connection.
- ❒ ⚠ In parallel installations, the “Jumper” (cable as bridge mode) connected from factory between the terminals **JP1** and **JP2** must be removed.

- Turn "On" the circuit breakers switches corresponding to the new UPS:
  - ❒ The input one from distribution panel and the one in the UPS.
  - ❒ In those equipments with static bypass line (**TWIN/3 PRO** > 10 kVA), also the bypass one of the protection panel and the one in the UPS.

  UPSs supply output voltage from bypass. Check the screen of the LCD from control panel in case there were any warning or error information.

  Measure the output voltage between the terminals **JP1** of the parallel system and terminals **JP1** of the new UPS, to check the voltage difference is under 1 V. In case the difference were higher than 1 V, double check the wiring and associated instructions.
- Put back the cover of the manual bypass of each UPS.
- Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up. All UPSs will transfer to "Normal mode”.

  Measure the output voltage between the terminals of the parallel system and the output terminals of the new UPS, to check the voltage difference is under 0,5 V. In case the difference were higher than 1 V, the UPSs have to be set (contact with the **S.T.S.**).
- Press over the shutdown key ⏻ in any UPS for more than 3 seconds and each one will be shutdown, supplying output voltage through the bypass.

  Turn “On” the output circuit breaker switch of the distribution panel, corresponding to the new integrated equipment. The complete parallel system will supply output voltage, through the bypass.
- Remove the cover of the manual bypass in each UPS.
- Transfer the equipments with the manual bypass ("BYPASS" position) to position "UPS". Do it in the switches of all equipments.
- Put back the protection cover of the manual bypass switch of all equipments, also check the torque of the fixing screws, otherwise any of the limit contacts could be activated and the manual bypass too.
- Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up, finally the parallel system will be working on "Normal mode”.

  Load/s are protected by the parallel system again.

5.6. Manual Bypass Switch (maintenance).

5.6.1. Operating principle.

Integrated manual bypass in all UPS from **SLC TWIN PRO** is very useful, but a wrong use can cause irreversible consequences for both the UPS and connected loads at its output. Therefore, it is important to respect the manoeuvring over the switch as it is stated in the following sections.

5.6.2. Transference to maintenance bypass.

- The procedure to transfer from normal mode to maintenance bypass is the same for a single equipment or a parallel system, less the quantity of actions:
  - ❒ For a single equipment.
    - – Press over the key ⏻ of the UPS for more than 3 seconds to shutdown the inverter. The acoustic alarm will beep for 3 seconds. The equipment will transfer to "Bypass mode".
  - ❒ For a parallel system.
    - – Press over the key ⏻ in any UPS for more than 3 seconds to shutdown all the inverters. The acoustic alarm will beep for 3 seconds. The equipments that belong to the current parallel system will transfer to "Bypass mode".
  - ❒ Put all the equipment/s on manual bypass. To do it remove the cover from manual bypass switch, which is located at the back of each equipment and turn all the switch to position "BYPASS".

    In parallel systems, proceed in the same way in each equipment.
  - ❒ ⚠ Keep in mind that on "Bypass mode" or with the switch on "BYPASS" position, the loads will be exposed to fluctuations of voltage, frequency and mains faults or blackouts, so in case it were possible, choose one day with the lowest probability of faults (days without fluctuations, days without storms,...) and do it as fast as possible.
  - ❒ Turn the input and bypass circuit breaker protections (**TWIN/3 PRO** > 10 kVA) of the equipment to "Off".

    In parallel systems, proceed in the same way over the same protections and in each equipment.

    The UPS still supplies output voltage, from mains directly

or through the static bypass line (**TWIN/3 PRO** > 10 kVA only), through the manual bypass of the equipment.

❒ Also, if the protection panel has manual bypass switch, remove the mechanical lock and turn the switch "On" (BYPASS).

In this case and in this case only, turn the output switch/es from distribution panel to "Off", depending if there is only one UPS or a system with "N" equipments in parallel.

The UPS is completely shutdown and inactive and loads are supplied through the manual bypass of the distribution panel.

5.6.3. Transference to normal mode.

- The procedure to transfer from maintenance bypass to normal mode, is the same for a single UPS or parallel system, less the quantity of actions to make:

❒ If the protection panel has manual bypass switch:

– Turn the output protection/s of the distribution panel to "On" previously, depending if there is a single UPS or a system with "N" equipments in parallel.

If the manual bypass switch is manipulated before turning "On" the output switch/es of the protection panel, the loads will not be fed.

– Turn the manual bypass switch of the panel to "Off" (UPS) and put the mechanical lock.

To avoid wrong manoeuvring the mechanical lock has to be fit, otherwise the equipment and loads are exposed to serious damages, even the destruction of both or fire.

❒ Turn input and bypass circuit breaker protections of the equipment (**TWIN/3 PRO** > 10 kVA) to "On".

In parallel systems, proceed in the same way in all the equipments over the same protections.

❒ Move the manual bypass switch to position "UPS" and put the protection cover the manual switch back.

Put back the protection cover of the manual bypass switch of all equipments, also check the torque of the fixing screws, otherwise any of the limit contacts could be activated and the manual bypass too.

In parallel systems proceed with the same operations in each equipment.

❒ For a single equipment.

– Press over the start up key ⏻ for more than 1 second, the acoustic alarm will beep for 1 sec. and the UPS will start up.

Load/s are protected by the equipment again.

❒ For a parallel system.

– Press over the start up key ⏻ for more than 1 second in any of the UPSs and all of them will start up, finally the parallel system will be on "Normal mode"

Load/s are protected by the parallel system again.

6. Control panel with LCD.

6.1. Control panel.

Fig. 16. Control panel view.

Button	Function	Description
⏻	Inverter start up	With no AC power supply and battery connected to the equipment (B0 or B1 equipments), press the button for 1 sec. as minimum to start up the inverter.
	UPS start up	When the unit is supplied from the AC input voltage and it is on bypass mode, press the key for more than 1 sec. to start up the inverter.
	UPS shutdown	When the equipment is ON and it has to be shutdown, presss for more than 3 sec. over this key.
▲	Enter into the main menu	When showing the main screen of the UPS by default in the LCD, press over this key for more than 1 sec. to enter into the main menu structure.
	Exit from main menu	Press over this key for more than 1 sec. to escape from the current menu, to the menu by default in the UPS, without executing any command or changing any configuration.
	Move upwards	Press this key for 1 sec. as minimum to move up in the browsing inside a menu.
▼	Move downwards	Press this key for 1 sec. as minimum to move down in the browsing inside a menu.
↵	Enter into the structure of the next menu	Press this key for 1 sec. as minimum to select the option in the current menu or to enter in the next menu, but without changing any setting.
	Select an option of the menu	Press the key for 1 sec. as minimum to select the option in the current menu or to enter in the next menu, but without changing any setting.
	Validate the current setting	Press the key for 1 sec. as minimum to validate the modified option and change the settings.

Table 6. Functionality of the buttons or keypad of the control panel.

- The UPS has a control panel with the following parts:
  - ❒ Four buttons or membrane keys, see table 6.
  - ❒ A LCD panel with two colours backlight. By default, the text or graphics messages are shown in white colour over blue background.

    When a critical alarm is activated on the UPS, the light of the text or graphic changes to dark orange with orange background.
  - ❒ Four led optical indicators that provides the following information:
    - Normal (green).
    - Battery (yellow).
    - Bypass (yellow).
    - Fault (red).

    Table 7 shows the individual function of each one of them or the interaction among them, as regards to the UPS status.

6.1.1. Functionality of the LEDs.

UPS status	Leds			
	Normal	Battery	Bypass	Fault
Bypass mode without output			✪	⅄
Bypass mode with output			●	⅄
UPS start up	□	□	□	□
Line mode	●			⅄
Battery mode	●	●		⅄
ECO mode	●		●	⅄
Battery test mode	□	□	□	□
Failure mode			⅄	●
Warning	⅄	⅄	⅄	✪

●: Permanently light.

□: Sequential and rotative light.

✪: Blinking light.

⅄: It depends on the fault, warning or any other condition.

Table 7. Function of the led optical indications.

6.1.2. Acoustic alarms.

Alarm condition	Modulation or alarm tone
Active fault	Continuous
Active warning	Beep every second
Output from battery	Beep every 4 seconds. With low battery (end of back up time), one beep every second.
Output from bypass	Beep every 2 seconds

Table 8. Acoustic alarms. Condition and modulation or tone.

6.1.3. Main screen.

- UPS control panel provides useful information about the status of the load, events, measures, identification and setting through the screen of the front panel.
- Immediately after the start up, the LCD panel shows the SALICRU logo for few seconds and next the main screen by default is displayed, where the status of the equipment is represented (figures 17 and 18).

- When the same menu is displayed for 15 minutes in the LCD, and there has not been any manipulation over the buttons, it will return back to main screen automatically.
- The main screen shows the following information by default:
  - ❒ Summary of the status, including the operating mode and load.
  - ❒ Status of the alarm, if there is any one active.

    The alarm includes the fault and warning informations.
  - ❒ Battery and status of the charge, including the battery voltage, charge level and charger status.
  - ❒ Continuous information includes the UPS in parallel and running time.

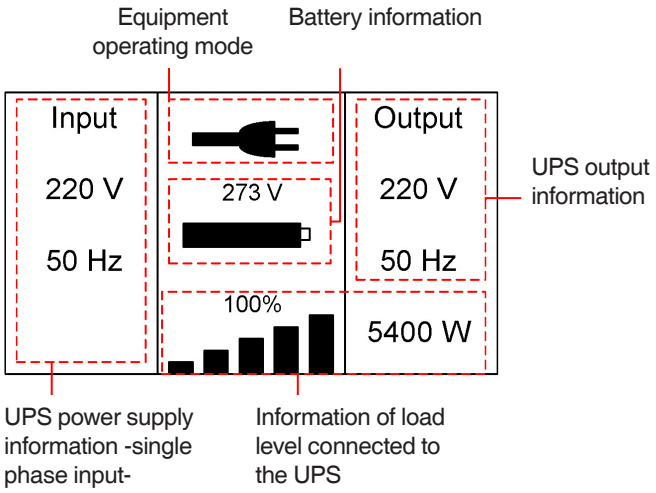


Fig. 17. Main screen of the equipment with single phase input.

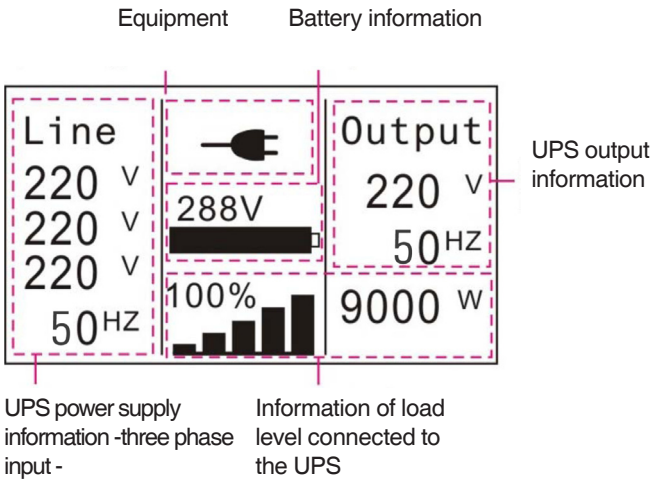


Fig. 18. Main screen of the equipment with three phase input.

- All the screens shown in the figures of this chapter correspond to an equipment with three phase input. Only figure 17 shows the main screen of single phase input equipment, in order to compare it with figure 18, which is for a three phase equipment.

  A part from the difference as regards to battery voltage, power that belong to the model, the values phase to neutral or phase to phase and neutral can be appreciated.
- For more details about the representations in the LCD of the control panel, see next section 6.2.

6.2. Operating modes of the equipment.

- The different graphical symbols displayed in the LCD of the control panel, correspond to the following operating modes or status:
  - ❒ **Normal mode:**

    The UPS is running on normal mode with power supply present.

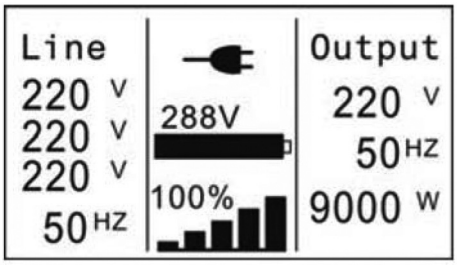


Fig. 19. Normal mode screen.

  - ❒ **Battery mode:**

    When the UPS is running on battery mode, the alarm beeps every 4 seconds.

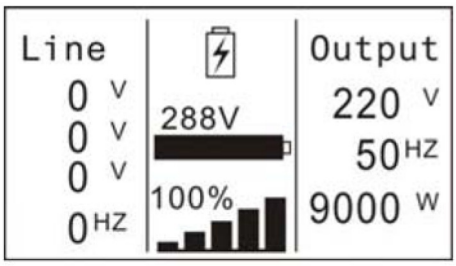


Fig. 20. Battery mode screen.

  - ❒ **Bypass with output voltage:**

    The output voltage that feeds the load comes from the commercial mains directly through the internal filters. This way the loads are not protected against mains faults or blackouts. The acoustic alarm beeps every 2 minutes.

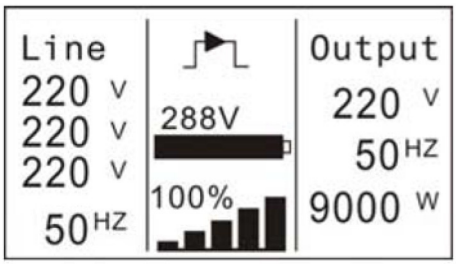


Fig. 21. Bypass with output voltage screen.

❒ **Bypass without output voltage:**

The UPS is running on bypass mode without output voltage.

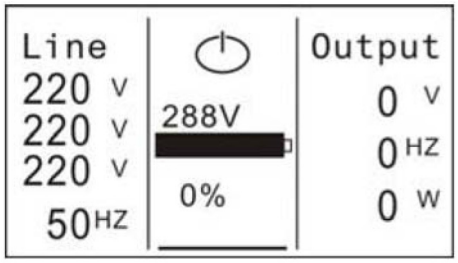


Fig. 22. Bypass without output voltage screen.

❒ **ECO mode:**

Once the UPS is started up, the energy that feeds the load/s comes from the commercial mains directly through the internal filters, meanwhile the voltage is inside the limits set as normals.

When input power supply fails, due to fault or wrong, the equipment will transfer from "Line mode" to "Battery mode" to supply the load/s properly.

– This function can be activated through the control panel (by means of password) or through a suitable software (WinPower, ...)

– The transfer time between "ECO mode" and "Battery mode" is around 10 ms. Nevertheless, this time can be excessive for some type of loads, so the ECO mode operating has to be considered according to this issue.

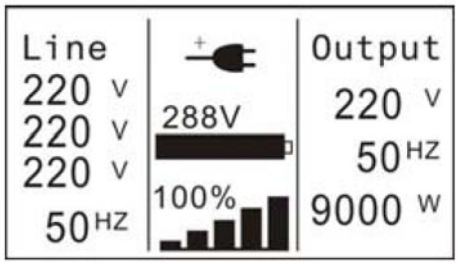


Fig. 23. ECO mode screen.

❒ **Frequency converter mode.**

In the frequency converter mode, the static bypass is disabled and any of the operating modes of itself, because the input and output frequencies of the UPS are different (50 or 60 Hz). When the input power supply fails, due to fault or wrong, the equipment will transfer to "Battery mode" to feed the load/s properly.

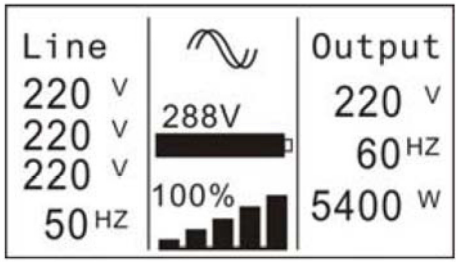


Fig. 24. Frequency converter mode screen.

– This function can be activated through the settings of the control panel (by means of password) or by means of a suitable software (WinPower, ...)

– The power of the UPS will be the 60% of the nominal, when it is running on "Frequency converter mode" in equipments with single phase input. Nevertheless for equipments with three phase input, there is not any derate.

❒ **Warning.**

When there is a "Warning", it means that there is something wrong in the UPS operating. Usually, the problems are not serious and the equipment can be kept running. However, pay attention to it, because the UPS could fail.

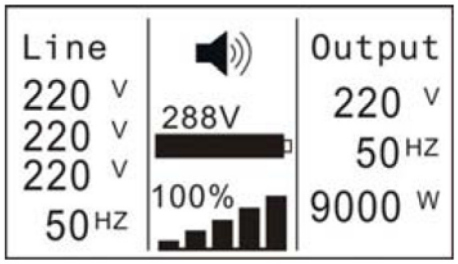


Fig. 25. Warning screen.

❒ **Fault.**

When a fault occurs, it reveals that some serious problems have happened, the UPS will break the output voltage or will transfer to bypass and the alarm will be saved. The screen will change its blue colour to orange as an intuitive warning mode.

Fig. 26. Fault screen.

❒ **Overload.**

When the UPS is overloaded, an alarm is triggered with a beeping of twice per second. Decrease the load level connected at the output of the equipment, till the power doesn't exceed from the nominal power of itself.

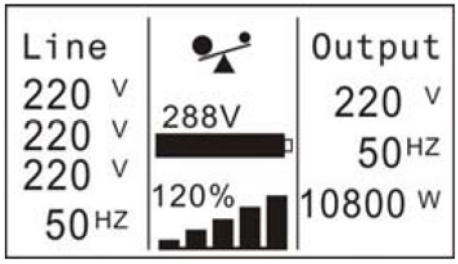


Fig. 27. Overload screen.

❒ **Battery test.**

The UPS is running a battery test.

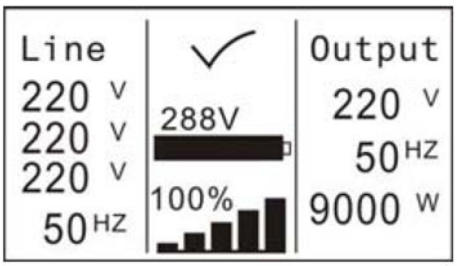


Fig. 28. Battery test screen.

❒ **Battery fault.**

When the battery status sensor shows "Faulty battery detected" or "Battery disconnected", the symbol of faulty battery is shown in the screen and the alarm will be saved.

Fig. 29. Faulty battery screen.

6.3. Operating of the LCD panel.

- Less in the main screen, which summarizes the UPS status, the user can get more useful information about the current conditions of the equipment, details of measures, event data logger, the own identification of the UPS, and change the settings to be adapted to the own needs, and optimise the function of the equipment.

6.3.1. Main screen.

- From main screen, when pressing the key ▲ or ▼ for less than 1 sec., it is shown detailed information about the alarm, parallel system and batteries.
- From the same main screen, when pressing the key ▲ for more than 1 sec., the structure of the main menu will be displayed (see figure 30).

  To display the different submenus, press the keys ▲ or ▼ for less than 1 sec., considering that with each pulsation the submenus will be moved to the next or previous depending on the pressed key.

  The structure of the main menu includes six submenus:

  ❒ UPS status
  ❒ Event log
  ❒ Measurement
  ❒ Control
  ❒ Identification
  ❒ Setting. With password only and by the **S.T.S.**

6.3.2. UPS status submenu.

- When pressing the key ↵ for less than 1 sec. from the "UPS status" screen, it is returned to main screen.
- The contents of the UPS status menu, is the same as the main screen (see figure 31).
- When pressing the key ▲ for more than 1 sec., the LCD will show the "UPS status" screen of the main menu structure again.

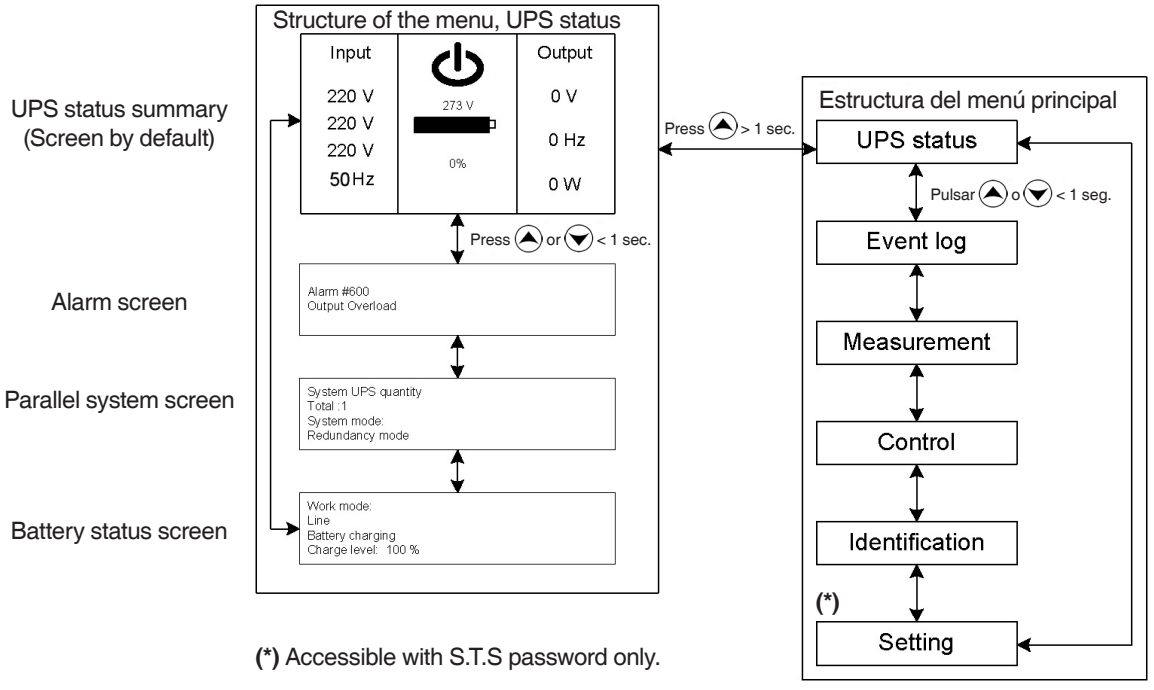


Fig. 30. Main screen structure.

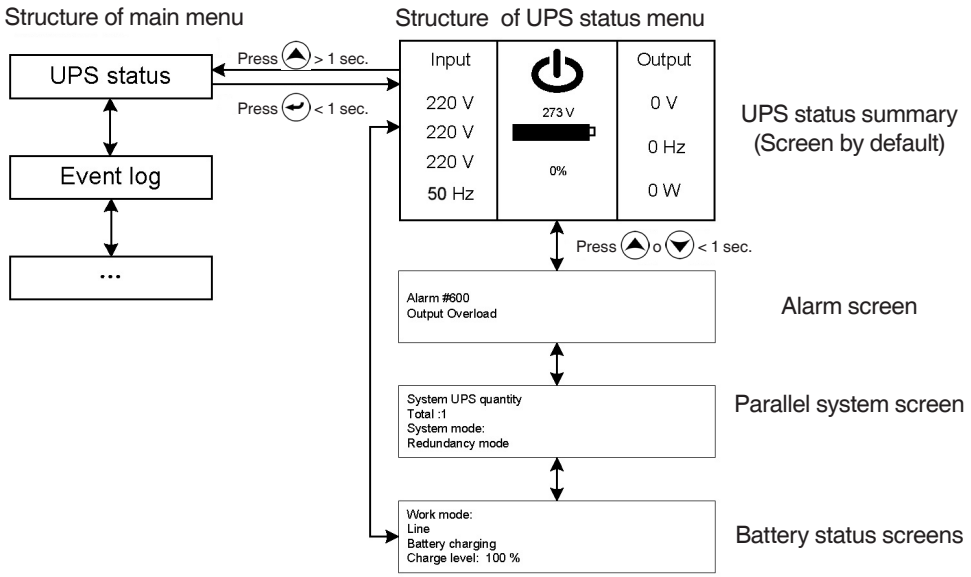


Fig. 31. UPS status screen.

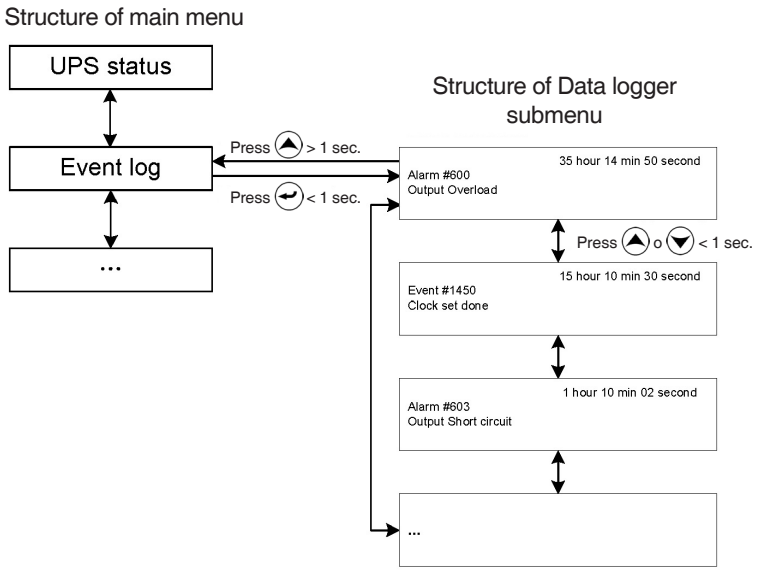


Fig. 32. Event logger submenu.

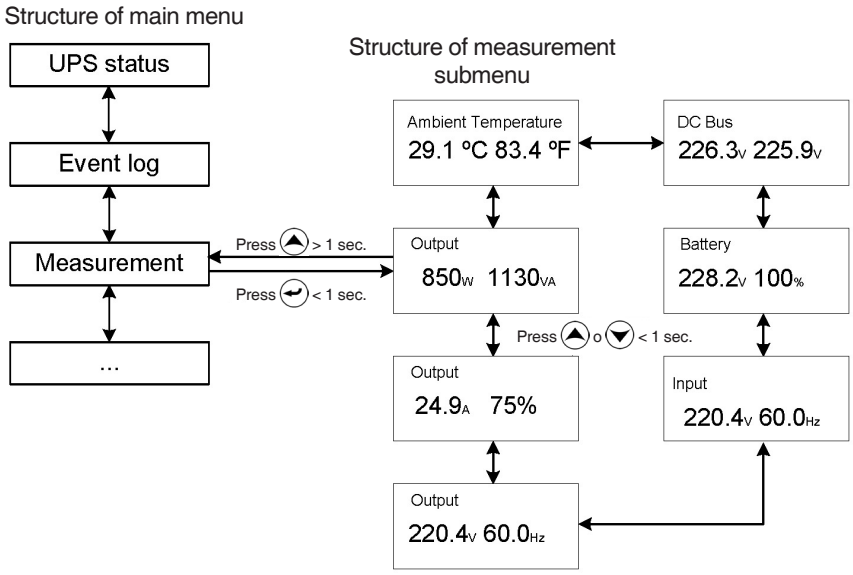


Fig. 33. Measurement submenu screen.

6.3.3. Data logger submenu.

- When pressing the key ↵ for less than 1 sec. from the "Event log" screen, it is accessed to the event data logger structure (see figure 32).
- Alarm and faults data logger is registered in this submenu and each one includes the event code, as well as the period of time that the UPS was running under these conditions.
- When pressing the keys ▲ or ▼ for less than 1 sec. the next and previous events can be checked depending on the pressed key. The system is cyclic so you can move in both directions.

  The maximum quantity of registers of the data logger is 50, so a new input will delete the oldest register.
- When pressing the key ▲ for more than 1 sec., the LCD panel will display the screen "Event log" from the main menu structure again.

6.3.4. Measurement submenu.

- When pressing over the key ↵ for less than 1 sec. from "Measurement" submenu, it is accessed to the measurements structure (see figure 33).
- From this submenu the following information can be got:
  - ❒ Input voltage and frequency.
  - ❒ Output voltage and frequency.
  - ❒ Output current and load level connected in %.
  - ❒ Supplied power at the output in W and VA.
  - ❒ Ambient temperature in centigrade degrees (ºC) and Fahrenheit (ºF).
  - ❒ DC bus voltage
  - ❒ Battery voltage and battery charge level.
- When pressing the key ▲ for more than 1 sec., the LCD will display the "Measurement" screen from main menu structure again.

6.3.5. Control submenu.

- When pressing the key the key ↵ for less than 1 sec. from this "Control" submenu, it is accessed to the control structure (see figure 34).
- Shutdown of a single UPS (individual): It is a command to shutdown the UPS that is running in a parallel system currently and other equipment of the system will supply the load/s in the parallel system.
- Battery test of a single UPS (individual): It is a control command for a UPS that it is running in a parallel system currently , to make a battery test equipment by equipment.
- Battery test of parallel UPSs: It is a control command of all parallel UPS, to make the battery test in all the equipments that made it up.
- EPO status cleared: When the EPO button is activated, the UPS output breaks the supply, either if the configuration is single or it is parallel and power supply to loads is broken.

  To restore the normal condition, the EPO button has to be deactivated previously (close the circuit again) and enter into the "Clear EPO status" submenu to clear the current status of the EPO. Doing this the alarm of the UPS is cleared and the output voltage is restored through the bypass (bypass mode). The equipment recovers the start up functionality with its normal procedure. See figure 35 as an example.
- Error status cleared: When there is a fault in the UPS, the fault and alarm mode is activated.

  To restore the normal status, enter into this menu to clear the error status. Doing this the alarm of the UPS is cleared and the output voltage is restored through the bypass (bypass mode). It is needed to check the cause and cancel it before starting up the equipment again with its normal procedure.

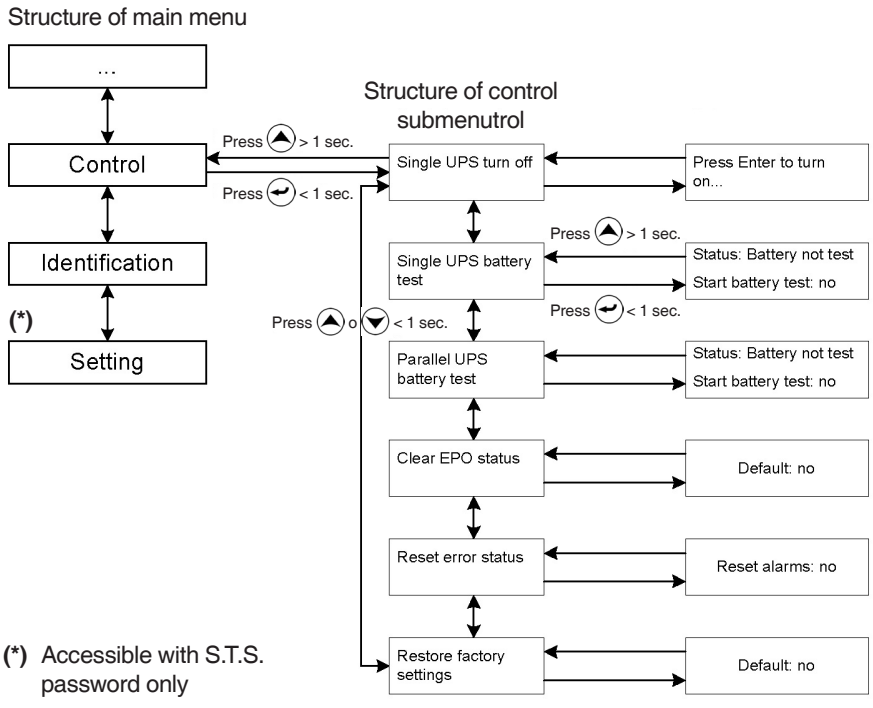
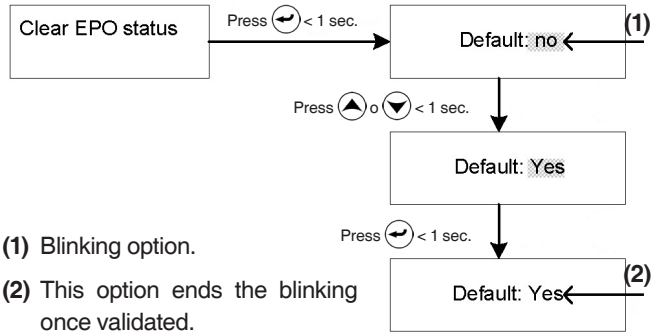


Fig. 34. Control submenu screens.



(1) Blinking option.

(2) This option ends the blinking once validated.

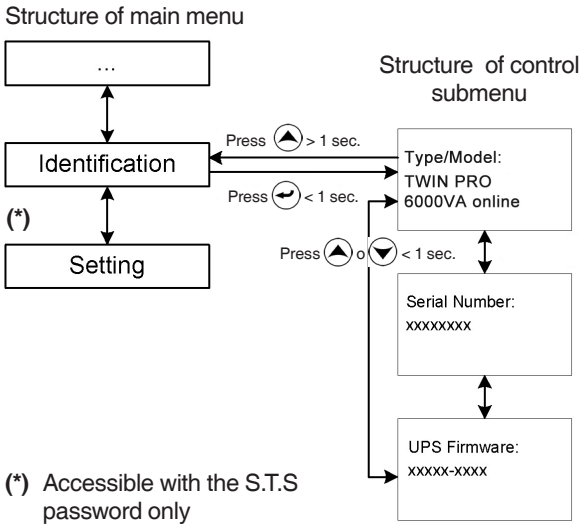
Fig. 35. Example of screens of EPO status cleared.

- Restore the preset configuration from factory: All values are set to the preset values from factory. This action can only be done on bypass mode.

6.3.6. Identification submenu.

- When pressing over the key for less than 1 sec. from "Identification" submenu, it is accessed to the identification structure (see figure 36).

  This submenu shows the serial number of the UPS, firmware version and model of the equipment.
- When pressing the key for more than 1 sec., the LCD panel will display the "Identification" screen from the main menu structure again.



(*) Accessible with the S.T.S password only

Fig. 36. Identification submenu screens.

6.3.7. Setting submenu.

- This submenu is exclusively reserved for Service and Technical Support or authorised personnel and it is only accessible by password.

  Some settings modify the specifications and settings to activate or deactivate some functions. Wrong modifications and/or settings can make possible faults or lack of protection to the own UPS and even they can affect or damage the load/s or battery.
- Almost all the settings can only be done meanwhile the UPS is on bypass mode.

6.4. Special functions

The UPS has some special functions, that could satisfy a special application of the user.

In case you require any of these special functionalists, contact with the **S.T.S.** to change the standard configuration from factory.

6.4.1. Operating on ECO mode.

6.4.1.1. Short description of the ECO mode.

- "ECO mode" function allows supplying the load/s from mains directly, through the internal filters only, meanwhile the energy is inside the limits, so the UPS allows an "Economy mode" and with high efficiency > 0,97.
- When mains is out of tolerances (voltage and/or frequency), or there are mains failures or blackouts in the power supply, the UPS will transfer to "Normal mode" or "Battery mode" depending on the case and the load/s will be supplied in a safety way.
- Nevertheless, the contras are:
  - ❒ Load can't be protected at 100 %, because on "Line mode" the load/s are supplied from commercial mains directly and through the internal filters of the bypass.
  - ❒ The transfer time of the "ECO mode" to "Battery mode" is 10ms approximately.

  Therefore, this function is not suitable for some sensitive loads or areas with unstable power supply.

6.4.1.2. To establish the ECO mode function.

- The function can be activated or deactivated through the “Setting” submenu (see section 6.3.7).

6.5. Operating as frequency converter.

6.5.1.1. Short description of the frequency converter function.

- In the converter mode, the static bypass is disabled and any of the operating modes of itself, because the input and output frequencies are different (50 or 60 Hz). When input mains fails, either due to a blackout or wrong, the equipment will transfer to “Battery mode” to supply the load/s properly.
- The output frequency is set to the preset value and required by the loads. Nevertheless, the contra is the capacity of the UPS, which is derated up to the 60% of the nominal in the "Converter mode”.

6.5.1.2. To establish the Converter mode function.

- The function can be activated or deactivated through the “Setting” submenu (see section 6.3.7).

7. Maintenance, warranty and service.

7.1. Battery maintenance.

- Pay attention to the safety instructions regarding battery and the stated in section 1.2.3.3.
- The UPSs from **SLC TWIN PRO** series only requires a minimum maintenance. The used battery in the standard models is lead acid, sealed, VRLA and maintenance free. These models require a minimum of reparations. The only requirement is to charge the UPS regularly, in order to prolong the battery lifetime. Meanwhile, it is connected to the power supply, never mind if the UPS is ON or OFF, it will keep the batteries charged and will give protection against overcharging and undercharging.
- The UPS has to be charged once, every 4 or 6 months if it has not been used for long time.
- In hot areas, battery has to be charged every 2 months. The charging time has to be 12 hours as minimum.
- Under normal conditions, the battery lifetime is from 3 to 5 years 25º C. In case that the battery was not in good conditions, it has to be replaced before. This replacement has to be done by qualified staff.
- Always replace them with the same quantity and type.
- Do not replace one battery only. All batteries have to be replaced at the same time and following the instructions of the manufacturer.
- Usually, the batteries should be charged and discharged every 4 or 6 months. The charging would be started after shutdown the UPS due to a low battery (discharging). Charging time for standard UPS should be 12 hours as minimum.

7.1.1. Notes for installing and replacing the batteries.

- If it is needed to replace the connection of any wire, purchase original parts through authorised distributors or service centres in order to avoid overheating and sparks with fire risk because the size is not enough.
- Do not short the + and - poles of the batteries, there is risk of fire or electrocution.
- Be sure that there is no voltage before touching the batteries. Battery circuit is not isolated from the input. Hazardous voltages can be found between the battery and earth terminals.
- Although the input and bypass circuit breaker switches (in **TWIN/3 PRO** > 10 kVA models) are turned off, the internal parts of the UPS are still connected to the batteries, so there are hazardous voltages inside.

  Therefore, before doing any reparation or maintenance task, the internal battery fuses have to be removed and/or the interlink connections between them and the UPS.
- Batteries have hazardous voltages. The battery maintenance and replacement have to be done by qualified personnel and familiarised with them. Nobody else can manipulate them.

7.2. UPS Trouble Shooting guide.

If the UPS doesn't work properly, check the information given by the LCD of the control panel, according to the models and power of the equipment. Try to solve the problem by means of the established steps in the tables 9 to 11. In case the problem persists, consult with our Service and Technical Support **S.T.S.**.

When it is needed to contact with our Service and Technical Support **S.T.S.** , provide the following information:

- UPS model and serial number.
- Date when the problem occurred.
- Complete description of the problem, including the information given by the led or LCD panel and the status of the alarms.
- Power supply condition, type of load and the level connected to the UPS, ambient temperature, cooling conditions.
- Information of the batteries (capacity and battery quantity), if the equipment is (B0) or (B1) -with external batteries-.
- Other informations that you may think that they are important.

7.2.1. Troubleshooting guide. Warning indications.

Indication in the LCD		Possible cause	Solution
TWIN PRO 4-10 kVA	TWIN/3 PRO 8-20 kVA		
Read EEPROM Error	-	UPS internal fault	Consult with the S.T.S.
Emergency Power Off	EPO Active Alarm code:71	EPO connector is open	Check the status of the EPO connector
On Maintain Bypass	On Maintain Bypass Alarm code:72	Manual bypass switch on BYPASS position and/or switch protection cover removed	Check the position of the switch and/or the location of the protection cover
Site Wiring Fault	-	Phase and neutral wires from input and output are reversed	Swap the phase and neutral connection
Battery Disconnected	Battery Disconnect Alarm code:11	Battery set is not properly connected	Battery test to be confirmed Check that the battery cabinet is connected (models (B0) and (B1)) Check the battery switch is on "On" position
Low Battery Warning	Battery low Alarm code:12	Low battery voltage	When the alarm beeps every 1 sec., means end of back up time
Output Overload	Output Overload Alarm code:41	Output overload	Check the load and remove the non-critical ones Check if any load is faulty or damaged
Fan Failure	Fan Failure Alarm code:84	Faulty fan/s	Check that the fan/s are working properly
Charger Failure	Charger Fail Alarm code:15	Battery charging fault	Consult with the S.T.S.
Battery DC Over Voltage	-	Battery voltage is higher than the normal	Check if the battery quantity is the suitable one
Over Charge	Over Charge Alarm code:14	Battery overcharged	The UPS transfers to "Battery mode" automatically and later on it checks if the battery voltage and mains are OK (corrects), the UPS returns back to "Normal mode" automatically again
Model Pin Error	Model Pin Error Alarm code:92	UPS internal fault	Consult with the S.T.S.
Ambient Over Temperature	-	Ambient temperature is too high	Check the ambient cooling
Heatsink Over Temperature Warning	Heatsink Over Temperature Alarm code:86	The temperature inside the equipment is too high	Check the UPS cooling and the ambient temperature of the room
NTC abnormal	-	UPS internal fault	Consult with the S.T.S.
Communication cable male disconnected	Para cable Male Loss Alarm code:E3	Parallel bus cable is disconnected	Check the parallel bus cable
Communication cable female disconnected	Para cable Female Loss Alarm code:E4	Parallel bus cable is disconnected	Check the parallel bus cable
Parallel Battery Connection Different	Para Bat Differ Alarm code:E6	The battery set is disconnected from the UPS	Check that all battery modules are connected
Parallel input Different	-	Any UPS input is disconnected	Check the connection of the room and building and the input connection Make sure that the input switch is turned "On" Check that all UPSs are connected to the same mains power supply
-	Para Byp Differ Alarm code:E8	Switch **(M2)** from bypass line of any equipment is disconnected (this switch is not available in models TWIN/3 PRO 8-10 kVA)	Check the connection of the room and building and the input connection Make sure that the bypass switch **(M2)** is turned "On" Check that all UPSs are connected to the same mains power supply
-	Para Line Differ Alarm code:E7	Switch **(M1)** from input line of any equipment is disconnected	Check the connection of the room and building and the input connection Make sure that the input switch **(M1)** is turned "On" Check that all UPSs are connected to the same mains power supply
Parallel Power strategy setting different	Para Work Mode Differ Alarm code:E9	There are different structure configurations set in the parallel system	The UPSs with different configuration do not accept the paralleling (i.e.: one on line mode and the other one on converter mode)
Parallel rated power capacity setting different	Para Rate Differ Alarm code:EA	There are different UPSs in the parallel system	Equipments with different power rate do not accept the parallel (i.e.: one of 8 kVA and another one of 10 kVA)
Parallel in HE mode	ECO In Para Alarm code:EB	ECO function is activated in the parallel system	ECO function is not allowed in a parallel system
Parallel load unbalance	-	UPS internal fault	Consult with the S.T.S.

Table 9. Troubleshooting guide. Warning indications.

7.2.2. Troubleshooting guide. Fault indications.

Indication in the LCD		Possible cause	Solution
TWIN PRO4-10 kVA	TWIN/3 PRO 8-20 kVA		
Inverter Overload Fault	Inverter Overload Fault Alarm code:42	Overload	Check the load and remove the non-critical ones Check if any load is faulty or damaged
Bypass Overload Fault	Byp Overload Fault Alarm code:43	Overload	Check the load and remove the non-critical ones Check if any load is faulty or damaged
Output Short Circuit	Output Short Circuit Alarm code:31	Output shortcircuit	Disconnect all the loads. Shutdown the UPS. Check if the UPS output and loads are on short-circuit. Make sure that the short-circuit has been removed before starting up the UPS and loads
Heatsink Over Temperature Fault	-	The temperature inside the equipment is too high	Check the UPS cooling and the ambient temperature of the room
-	Heatsink Over Temperature Fault Alarm code:81	The temperature inside the equipment is too high	Make sure that the UPS is not overloaded, cooling holes are not blocked and the ambient temperature is not too high. Shutdown the equipment and leave it at rest for 10 minutes as minimum to decrease the temperature before starting it up again. If the fault happens again, contact with the S.T.S.
Bus Over Voltage	Bus Over Voltage Alarm code:21	UPS internal fault	Consult with the S.T.S.
Bus Under Voltage	Bus Under Voltage Alarm code:22	UPS internal fault	Consult with the S.T.S.
Bus Unbalance	Bus Unbalance Alarm code:23	UPS internal fault	Consult with the S.T.S.
Bus short	Bus short Alarm code:24	UPS internal fault	Consult with the S.T.S.
Bus Softstart Failed	Bus Softstart Fail Alarm code:25	UPS internal fault	Consult with the S.T.S.
Inverter Over Voltage	Inv Over Voltage Alarm code:32	UPS internal fault	Consult with the S.T.S.
Inverter Under Voltage	Inv Under Voltage Alarm code:33	UPS internal fault	Consult with the S.T.S.
Inverter Softstart Failed	Inv Softstart Fail Alarm code:E34	UPS internal fault	Consult with the S.T.S.
Negative Power Fault	Negative Power Fault Alarm code:E1	Load is completely inductive or capacitive	Shutdown some non-critical loads. The inrush current of the loads is done through the Bypass. Make sure that there is not an overload and proceed with the start up of the UPS
Fatal EEPROM Fault	-	UPS internal fault	Consult with the S.T.S.
Cable male and female disconnected fault	Cable male and female Loss fault Alarm code:E2	Parallel bus cable is disconnected	Check the parallel bus cable
-	Backfeeder Alarm code:93	UPS internal fault	Do not touch the terminals of the equipment, which is connected to an electrical installation with a UPS. Even without the electrical power supply is very dangerous, because the equipment is an energy generator. Consult with the S.T.S.

Table 10. Troubleshooting guide. Fault indications.

7.2.3. Troubleshooting guide. Other circumstances.

Problem	Possible cause	Solution
No indications and no warning alarms, although the UPS is connected in the electrical mains	There is not input voltage	Check the building wiring and UPS power cord. Check UPS input switch and protection panel are turned "On"
BYPASS led lights although there is power supply	The inverter doesn't start up	Press over the start up key ⏻ for more than 1 second, the acoustic alarm will beep for 1 sec. and the UPS is turned "On"
BATTERY led lights and the acoustic alarm is triggered (1 beep every 4 sec.)	Input voltage and/or frequency out of range	Check the power supply. Check wiring of the building and the power supply cable of the UPS. Make sure that the UPS input switch and the protection panel are turned "On"
Back up time is shorter than the nominal	Batteries are not fully charged Faulty batteries	Charge the batteries for 12 hours and check the capacity

Table 11. Troubleshooting guide. Other circumstances.

7.3. Warranty conditions.

The limited warranty only applies to those products that you acquire for commercial or industrial use in the normal development of your business.

7.3.1. Covered product.

UPS **SLC TWIN PRO series**.

7.3.2. Warranty terms.

This product is guaranteed against any parts and/or labour defect for 12 months period from its commissioning by **our company** staff or other specifically authorised, or 18 months from its factory delivery, whichever expires first. In case of failure of the product inside the warranty period, we must repair, at our facilities at no cost, the faulty part or parts. The transport expenses and packaging will be borne to the user..

We guarantees for period time higher than 10 years, the availability of parts and spare parts, as hardware as software, as well as a complete assistance regarding the reparations, components replacement and software updating.

7.3.3. Out of scope of supply.

Our company is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of repairing or not authorized modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

7.4. Description of the available maintenance and service contracts.

When the warranty is expired, and adapting to the customer's needs, has several maintenance modalities:

Preventive.

It guarantees a higher safety to preserve the correct operating of the equipments with a yearly preventive visit, in which the specialised technicians of **our company** make several tests and sets in the systems:

- Measurement and write down input currents and voltages among the phases.
- Measurement and write down output currents and voltages among the phases.
- Measurement and write down floating currents and voltages, discharging and charging batteries.
- Checking the logged alarms.
- Checking and testing the measurements of the digital LCD panel:
  - ❒ Input voltages
  - ❒ Input currents
  - ❒ Output voltages
  - ❒ Output currents
  - ❒ Temperatures
  - ❒ Battery voltage and currents.
- Check the battery status.
- Check the fan status.
- Bypass test.
- Make a general cleaning of the equipment.
- Controlling the mechanical parts and temperatures.

This way, it is guaranteed the perfect operating and the possible coming faults are avoided.

These supervisions are usually done without shutdown the equipment. In those cases that a shutdown were needed, date and time would agree with the customer to do the task.

This maintenance modality covers, inside the working timetable, all the journey expenses and manpower.

Corrective.

When a fault occurs in the equipment operating, and previous notice to our Service and Technical Support (**S.T.S.**), in which a specialized technician will establish the failure scope and he will determine a first diagnostic, the corrective action starts.

The needed visits for its correct resolution are unlimited and they are included inside the maintenance modalities. It means that in case of failure, we will check the equipments as many time as it were needed.

Both preventive and corrective maintenance contracts, is possible to determine the **intervention timetable and response times**, as well as **exclusion or inclusion parts in partial or total way**, with the purpose to be adapted to the customer's need.

Consult our Website to have more information.

7.5. Technical service network.

Coverage, both national and international, from our Service and Technical Support (**S.T.S.**), can be found in our Website.

8. Annexes.

8.1. General technical specifications.

Models:	TWIN PRO				TWIN/3 PRO up to 10 kVA		TWIN/3 PRO > 10 kVA		
Available powers (kVA / kW)	**4 / 3,6**	**6 / 5,4**	**8 / 7,2**	**10 / 9**	**8 / 7,2**	**10 / 9**	**12 / 10,8**	**15 / 13,5**	**20 / 18**
Technology	**On-line double conversion, PFC, double DC bus**								
Rectifier									
Tipology of the input	Single phase				Three phase				
Quantity of wires	3 wires - Phase R(L) + Neutral (N) and earth				5 wires - 3 phases R(L1), S(L2), T(L3) + Neutral (N) amd earth				
Nominal voltage	208 / 220 / 230 / 240 V ac				3 x 380 / 3 x 400 / 3 x 415 V ac				
Input voltage range with 100 % load	176÷276 V ac				3 x 305÷478 V ac				
Input voltage range with 50 % load	110÷276 V ac				3 x 190÷478 V ac				
Voltage range of transference:	Depending on the load percentage between 100 and 50 %								
- Low mains voltage	176 / 110 V ac (±3 %)				305 / 190 V ac (± 3 %)				
- Restore from low mains	186 / 120 V ac (±3 %)				322 / 208 V ac (± 3 %)				
- High mains voltage	276 V ac (±3 %)				478 V ac (± 3 %)				
- Restore from mains high	266 V ac (±3 %)				461 V ac (± 3 %)				
Frequency	50 / 60 Hz (autosensing)								
Input frequency range	± 10 % (45-55 / 54-66 Hz)								
THDi	< 5 % at full load								
Power factor	> 0,99 (at full load)								
Inverter									
Technology	PWM								
Switching frequency	19,2 kHz								
Wave shape	Pure sinewave								
Nominal voltage	208 / 220 / 230 / 240 V ac				3 x 380 / 3 x 400 / 3 x 415 V ac				
Output voltage accuracy	± 1 %								
Voltage THD with linear load	< 2 %								
Voltage THD with non-linear load	< 5 %								
Output voltage recovering time	100 ms. (IEC 62040-3)				70 ms. (IEC 62040-3)		60 ms. (IEC 62040-3)		
Transient response of the output voltage (with load fluctuation of 0 %-100 %-0 %)	± 9 %				≤ 7 %		≤ 7 %		
Transient response of the output voltage (with load fluctuation of 20 %-100 %-20 %)	± 6 %				≤ 4 %		≤ 4 %		
Frequency	With mains present, synchronised at nominal input (45-55 / 54-66 Hz)								
	Free running, back up time mode 50 / 60 ±0,1 Hz				Free running, back up time mode 50 / 60 ±0,05 Hz				
Slew rate	1 Hz/sec.				< 1 Hz/sec.		1 Hz/sec.		
Power factor	0,9 (by default)								
	0,5 to 1 (selectable)								
Permissible load power factor	0,5 to 1 lagging								
Transfer time, inverter to battery	0 ms.								
Transfer time, inverter to bypass	0 ms.								
Transfer time, inverter to ECO	0 ms.								
Transfer time, ECO to inverter	< 10 ms.								
Efficiency at full load, line mode with 100% charged battery	> 92 %				> 93 %		> 94 %		
Efficiency at full load, on battery mode	> 92 %				> 93 %		> 94 %		
Efficiemcu at full load, on ECO mode	> 97 %				> 97 %		> 98 %		
Overload, line mode	105-125 %, 2 min.				100-110 %, 5 min. 110-130 % , 1 min. 130-150 %, 10 sec. > 150 %, 2 sec.		100-110 %, 5 min.		
	125-150 %, 30 sec.						110-130 %, 1 min.		
	> 150 %, 1 sec.						130-150 %, 10 sec.		
	-						> 150 %, 2 sec.		
Overload, battery mode	102-130 %, 10 sec.		105-125 %, 2 min.				100-110 %, 5 min.		
	> 130 %, 100 ms		125-150 %, 30 sec.				110-130 %, 1 min.		
	-		-				130-150 %, 10 sec.		
	-		-				> 150 %, 2 sec.		
Crest factor	3:1				maximum, 3:1		3:1		
Quantity of equipments in parallel connection	Up to 4 SAI's								
Static bypass									
Type	Hybrid (thyristors in antiparallel + relay)								
Nominal voltage	208 / 220 / 230 / 240 V								
Nominal frequency	50 / 60 Hz ±4 Hz								

Models:	TWIN PRO				TWIN/3 PRO up to 10 kVA		TWIN/3 PRO > 10 kVA		
Available powers (kVA / kW)	**4 / 3,6**	**6 / 5,4**	**8 / 7,2**	**10 / 9**	**8 / 7,2**	**10 / 9**	**12 / 10,8**	**15 / 13,5**	**20 / 18**
Batteries									
Voltage / capacity	12 V dc / 7 Ah		12 V dc / 9 Ah		12 V dc / 7 Ah		12 V dc / 9 Ah		
Quantity of batteries in serial / set voltage	20 / 240 V dc				24 / 288 V dc				
Low battery voltage, block / set	11,4 V dc / 228 V dc				11,4 V dc / 273,6 V dc				
End battery voltage:									
- From 0-30 % load, block / set	10,7 V dc / 214 V dc				10,7 V dc / 256,8 V dc				
- From 30-70 % load, block / set	10,2 V dc / 204 V dc				10,2 V dc / 244,8 V dc				
- From > 70 % load, block / set	9,5 V dc / 190 V dc				9,5 V dc / 228 V dc				
Internal battery charger									
Type of charge	I / U (Constant current / constant voltage)								
Constant current / constant voltage	1 A / 273 V dc (13,65 V dc block)				1,4 A / 273 V dc (13,65 V dc block.)		4 A / 345,6 V dc (14,4 V dc block.)		
Floating voltage, block / set	13,65 V dc / 273 V dc				13,65 V dc / 327,6 V dc				
Maximum charging current	1 A				1,4 A		4 A		
Recharging time	5 hours at 90%				8 hours at 90%		5 hours at 90%		
Leakage current	< 500 µA								
Voltage / temperature compensation	– 3 mV / ºC per battery annd above 25 ºC								
Internal battery charger option (B1)									
Maximum charging current	-				-		8 A		
Generals									
Communication ports	2 (RS232 and USB, mutally exclusive)								
Monitoring software	WinPower (free download)								
Noise level at 1 m.	< 50 dB		< 55 dB						
Operating temperature	0-45 ºC								
Storage temperature	– 15 ºC to + 50 ºC								
Storage temperature without batteries	– 20 ºC to + 70 ºC								
Operating altitude	< 1000 m (for higher altitudes correct according to table 13)								
Relative humidity	0-95 % non-condensing								
Protection degree	IP20								
Dimensions (Depth x Width x Height)	550 x 260 x 708						650 x 350 x 890		
Weight	86 kg		92 kg		99 kg		183 kg		
Safety	EN-IEC 62040-1; EN-IEC 60950-1								
Electromagnetic compatibility (EMC)	EN-IEC 62040-2								
Marking	CE								
Quality system	ISO 9001 and ISO 140001								

Table 12. General technical specifications.

Altitude (m.)	1000	1500	2000	2500	3000	3500	4000	4500	5000
Power	100%	95%	91%	86%	82%	78%	74%	70%	67%

Table 13. Power correction in relation to the working height.

8.2. Glossary.

- **AC.-** It is nominated as alternating current (abbreviation in Spanish CA and in English AC) to the electrical current in which the magnitude and direction varies in a cyclic way. The most common wave shape of the alternating current is sinewave, because the energy transmission is better. Nevertheless, some applications could need other period wave shapes, like triangular or square
- **Bypass.-** Manual or automatic, it is the physical junction between the input and the output electric device.
- **DC.-** The direct current (CC in Spanish, DC in English) is the continuous electron flow through a cable between two points with different potential. Unlike the alternating current, in direct current the electrical loads always flow in the same direction from the highest potential point to the lowest one. Although, usually the direct current is identified with the constant current (for example the one supplied by the battery), it is continuous any current that always maintain the polarity.
- **DSP.-** It is the acronym of Digital Signal Processor. A DSP is a system based on a processor or microprocessor that has instructions in it, a hardware and an optimised software to develop applications where numerical operations are needed with very fast speed. Due to this, it is very useful to process analogical signals in real time: in a system that runs in this way (real time) samples are received, usually coming from an analogical/digital converter(ADC).
- **Power factor.-** It is defined as power factor, p.f., of an alternating current circuit, as the ratio between the active power, P, and the apparent power, S, or as the cosines of the angle that make the current and voltage vectors, designating as cos □, being □ the value of that angle.
- **GND.-** The term ground, as its name states, refers to the potential of the earth surface.
- **EMI filter.-** Filter able to decrease the electromagnetic interferences, which is the perturbation that happens in a radio receptor or in any other electrical circuit caused by the electromagnetic radiation coming from an external source. Also it is known as EMI, ElectroMagnetic Interference, Radio Frequency Interference or RFI. This perturbation can derate or limit the efficiency of the circuit.
- **IGBT.-** The Insulated Gate Bipolar Transistor is a semiconductor device that is used as a controlled switch in power electronic circuits. This device has the feature of the gate signal of the effect field transistors with the capacity of high current and low voltage saturation of the bipolar transistor, combining an isolated FET gate for the input and a bipolar transistor as switch in a single device. The triggering circuit of the IGBT is as the MOSFET one, while the driving features are like the BJT.
- **Interface.-** In electronic, telecommunications and hardware,

an interface (electronic) is the port (physical circuit) through which are sent or received signals from a system or subsystems toward others.

- **kVA.-** The voltampere is the unit of the apparent power in electrical current. In direct current is almost equal to the real power but in alternating current can defer depending on the power factor.
- **LCD.-** LCD acronym of Liquid Crystal Display, device invented by Jack Janning, who was employee of NCR. It is an electric system of data presentation based on 2 transparent conductor layers and in the middle a special crystal liquid that have the capacity to orientate the light when trespassing.
- **LED.-** LED acronym of Light Emitting Diode, is a semiconductor device (diode) that emits light almost monochrome with a very narrow spectrum, it means, when it is direct polarized and it is crossed by an electric current. The colour, (wave longitude), depends on the semiconductor material used in its construction, being able to vary from the ultraviolet one, going through the visible spectrum light, to the infrared, receiving these last ones the denomination of IRED (Infra Red Emitting Diode).
- **Circuit breaker.-** A circuit breaker or switch, is a device ready to break the electrical current of a circuit when it overcomes the maximum set values.
- **On-Line mode.-** Regarding to an equipment, it is on line when it is connected to the system, and it is in operation, and usually has its power supply turned on.
- **Inverter.-** An inverter, is a circuit used to convert direct current into alternating current. The function of an inverter is to change an input voltage of direct current into a symmetrical output voltage of alternating current, with the required magnitude and frequency by the user or the designer.
- **Rectifier.-** In electronic, a rectifier is the element or circuit that allows to convert the alternating current into direct current. This is done by rectifier diodes, which can be solid state semiconductors, vacuum or gassy valves as the mercury vapour. Depending on the features of the alternating current power supply used, it is classified as single phase, when they are fed by a single phase electrical mains, or three phase when they are fed by the three phases. Depending on the rectification type, they can be half wave, when only one of the current semi-cycles is used, or full wave, where both semicycles are used.
- **Relay.-** The relay(in French relais, relief) is an electromechanical device that works as a switch controlled by an electric circuit where, through an electromagnet, a set of contacts are moved and it allows to open or to close other independent electric circuits.
- **SCR.-** Abbreviation of «Silicon Controlled Rectifier», called commonly as Thyristor: semiconductor device of 4 layer that works as almost an ideal switch.
- **THD.-** They are the acronyms of «Total Harmonic Distortion». The total harmonic distortion is done when the output signal of a system is not equivalent to the one that enter into it. This lack of linearity affects to the wave shape, because the equipment has introduced harmonics that they were not in the input signal. As they are harmonics, it means multiple of the input signal, this distortion is not so dissonant and it is more difficult to detect.

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